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Textile World

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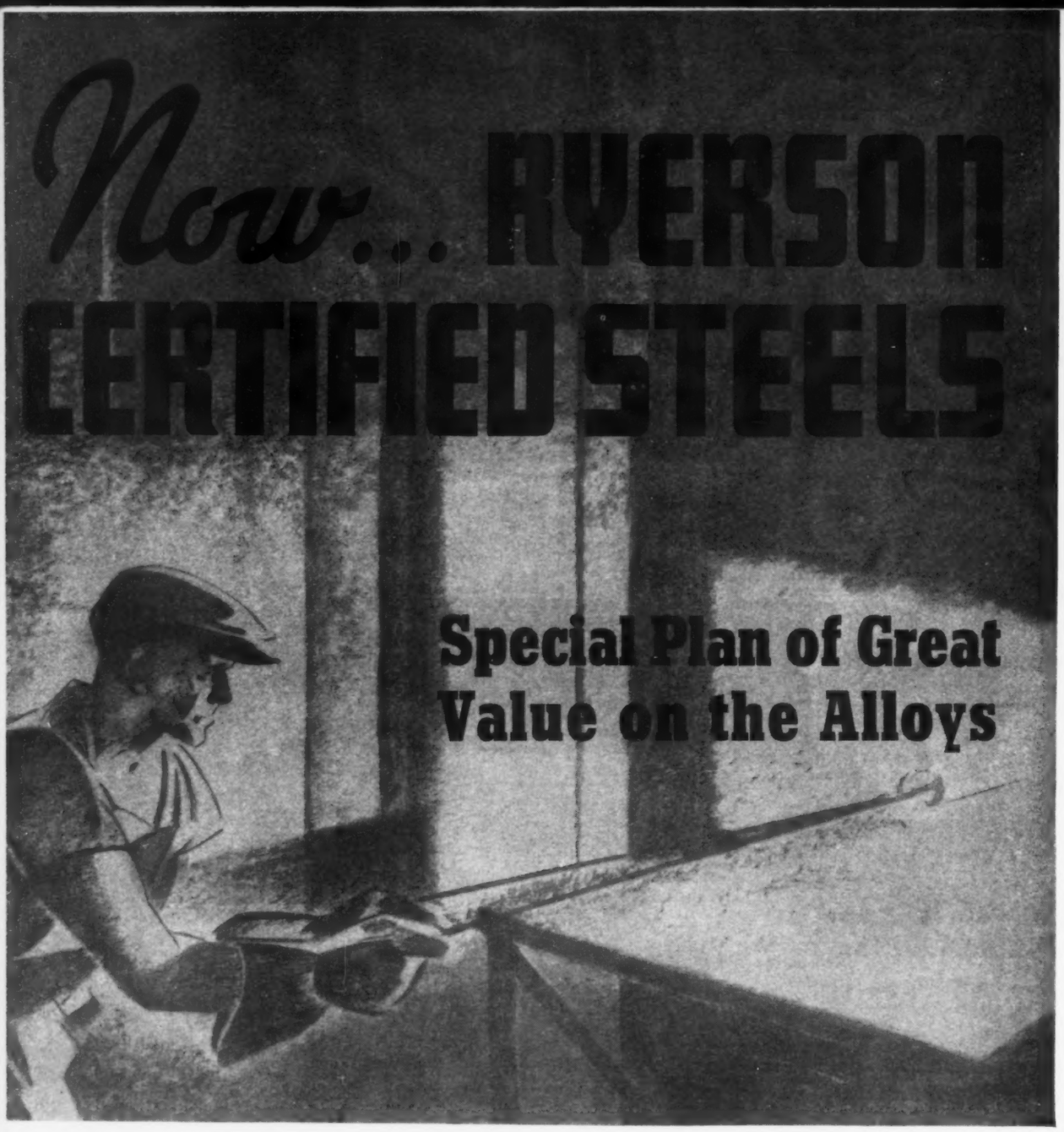

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Textile World

October, 1937

Editor: DOUGLAS G. WOOLF

Good He-Man Gloom Follows He-Man Glee

ONE of the grandest traits of the American people is their heartiness. They don't do things in a nice, moderate, restrained sort of way. They plunge in with both hands and both feet.

If they are optimistic, for example, they put on rose-colored glasses, with blinders, and any man who dares see a speck on the horizon is a traitor—one who would sell America short—and so forth and so on.

Then when they turn pessimistic, they purge their souls of all frivolity and light-heartedness, and concentrate on the gloom in a big way. At that time, anyone who suggests that maybe it will come out all right is just a fool Pollyanna.

The two stages have been encountered within the last six months—and probably textile men have been the best quick-change artists. Last winter, on a trip in the field, we were almost run out of several towns on a rail because we had urged in TEXTILE WORLD that textile manufacturers heed certain caution signals, and watch their production. In contrast, we have just returned from a trip on which we didn't hear one encouraging comment.

And that chorus of misery is being echoed throughout the land. But to us, the most terrifying symptom was a statement last month from the Secretary of Commerce that a "very important surge forward in business" was due within a few weeks. That was too reminiscent!

NOW we must admit that there has been ample reason for apprehension in textile circles lately. The cotton price collapse, with all the uncertainties attendant upon the future of that fiber, not only upset that division of the industry but had a sympathetic reaction in other divisions. The stock-market crash, and the apparent inability of the Street to find a firm bottom, brought back that factor into industrial life for the first time in several years. The net result of these and other influences was practical paralysis of business—which is still with us to a considerable extent as we write this.

The worst feature, in our opinion, is the absence of real facts as to just what the situation is. Take the inventory factor, for example. We have just returned from lunching with an editor in another field who spent an hour bemoaning the fact that the country was lost in a sea of inventory, and that national bankruptcy would result if factories didn't stop adding to that flood. But after we got down to brass tacks we both agreed that neither of us—in fact nobody—knows what the real inventory position is in most branches of industry. Certainly nobody does in textiles. That fact has been emphasized repeatedly—and just a year ago by Robert R. West at the Cotton-Textile Institute meeting—but nothing has been done about it.

WE SUGGEST to textile associations that one of the best jobs they can do during the next year is to tackle this problem of securing integrated statistics which, as Mr. West specified, would make possible a sound appraisal of the total available supply of stock and rate of take-off of textiles. In fact, we believe that could best be done by a coordination committee, representing all the various branches of the industry and their associations.

Meanwhile, we would also suggest that the gloom be tempered with a little sense of humor. Any industry which has been through the grief of the recent depression—and of the private textile depression which preceded it—can stand some more. Any firm which survived that is tough enough to take it still.

Furthermore, any idea that the up-swing in both general and textile business has passed and that we are now starting on the down-grade is bunk. This is an interruption.

And we stick to that statement even if it sounds a little like the Secretary of Commerce talking!

The Editor Says

The Undistributed Profits Tax

IT is good news that the Cotton-Textile Institute has appointed a committee to study the tax problems of the industry—and to work particularly for modification of the undistributed profits tax. It is to be hoped that other branches of the industry will do likewise—and that the work of the several associations will be coordinated in some way.

This subject demands study—and especially right now. All through last session of Congress, it was apparent that revision of the law was not a possibility, and therefore any effort at that time would have been wasted. Now, however, there seems to be a real chance for action at next session, and it is none too early to develop an aggressive program in that direction.

It is necessary to be specific in discussing this question. So many criticisms have been leveled against the act that any general statement is entirely too vague.

In our opinion one of the most amazing features of the undistributed profits tax provision is the failure to exempt money spent on expansion and modernization of plant and equipment. At a time when great sums of public money were being used to prime the pump, and to get the capital goods industries into action, a definite and sure obstacle was put in the way of revival of those industries! That just doesn't make sense.

Testimony on this point is eloquent. We have our own file of specific instances supplied us, usually in confidence, by textile manufacturers. But there is also the public record: the representations made by most of the large organizations of business men. The Chamber of Commerce of the U. S., the National Association of Manufacturers, the Consumer Goods Industries Committee, and numerous other groups have studied the problem and found the levy discriminatory and dangerous.

In our talks with Senators, Representatives, and Administration officials of all shades of political and economic faith, we have not found one who was anxious to defend the failure to exempt plant modernization from the undistributed profits tax. A very few did not want plant expansion exempted but the great majority favored such exemption, on the ground that any other policy would mean "freezing" the present structure and at the same time penalizing the small concern.

Business and Government should be able to work together this winter for the correction of this absurd situation.

A Man-Sized Job

DURING the last month, we have asked many people —mostly cotton manufacturers—what they thought should be done about the whole raw cotton situation: just what each would prescribe if he were made boss-man. Despite all the kicks that have been going up from points North, East, South and West, the great majority of these men answered "I don't know a thing about cotton." Obviously, with a few exceptions, this was an incorrect statement. But its implication was correct in that nobody really knows what *ought* to be done about cotton from this point on. Particularly is there great uncertainty as to the next step. People can supply, as answers, research, chemurgy, promotion: long-term plans which eventually will increase the demand for cotton and its products. We are 100% for these plans, of course.

However, they do not answer the question of what to do in the next 30, 60, or 90 days; what Congress ought to do at the next session; what we should retain of our present program, and what we should discard; what new plans, if any, should be adopted.

The majority of people seem agreed that, as soon as possible, the price of American cotton should be allowed to find its own level freely. But before that freedom is realized, there are a great many anchors and balloons now attached to it which will have to be cast off; and a great many more planned for the next session which will have to be avoided.

Farm leaders have been meeting all over the map in recent weeks. We suggest that cotton manufacturers, through their associations, could profitably spend a little time together during the next several weeks trying to work out some sort of a suggestive program which will once again permit economic forces to work in cotton without bringing any more grief to the cotton farmer than he already has had, and still has in store.

That's a man-sized job—but it has to be tackled.

"Midsummer Madness"

GROTON, CONN.

Editor, TEXTILE WORLD:

Please advise if you can supply additional copies of the comic sketch, "Midsummer Madness" by Julius B. Goldberg in the August issue of TEXTILE WORLD. It is *excellent.*

W. W. JOHL,
Assistant Treasurer, Max Pollack & Co., Inc.

* * *

STOUGHTON, MASS.

Editor, TEXTILE WORLD:

We have just read your article entitled "Midsummer Madness," and would like to say that if there was a debate regarding the publication of this article, the editorial staff of TEXTILE WORLD needs reorganization and not the Supreme Court.

H. F. LORD
J. W. Wood Elastic Web Co.

* * *

NEW YORK, N. Y.

Editor, TEXTILE WORLD:

"Midsummer Madness" by Julius B. Goldberg, is one of the cleverest things I have ever seen.

The funny part of this whole thing is that it isn't funny.

Mr. Goldberg certainly grasped well a real problem, and I congratulate him upon having so interestingly and ably expressed something that for years must have been in the minds of many, many business executives.

SYLVAN I. STROOCK
President, S. Stroock & Co. Inc.

Shrinkage Tables

A REAL NEED has existed for tables showing shrinkages up to 25% on pieces up to 100 yd. long. Our own office mail reflects this demand. To meet it, we have induced the author of an old and incomplete book of shrinkage tables to revise it and expand it to fill the above requirements. We are publishing these ready-reference tables complete in this issue, starting on page 101.

In the News

Process Tax To Be Proposed

From TEXTILE WORLD'S *Washington Office*

Crop-control legislators, in the next session of the Congress, will again propose a tax on processors, to finance soil-building and fallow-acreage payments to farmers. Agricultural economists in Washington, trying to foresee what kind of law will be enacted, believe Congress would face strong public opposition against any move to continue using $130,000,000 a year out of customs receipts for that purpose. But cotton and other mill operators are already mobilizing vigorous resistance to the proposed tax.

Secretary Wallace's eight-point program for soil depletion and soil building goals now rests on what is left of AAA. Cooperation in its terms is purely voluntary. If farmers think they can make more money by jumping the tugs than by staying in and pulling, they do so. And some Washington authorities say that Mr. Wallace cannot stabilize agriculture except with a law that will command compliance rather than merely bid for cooperation. Others believe the present law, with attractive benefits, is adequate for a high degree of compliance. Mr. Wallace himself is inclined to conservative crop control; he believes that substantial production must be maintained to supply and hold the export market.

It is generally thought that Representative Marvin Jones of Texas, chairman of the House Agricultural Committee, was presenting the President's ideas when he wrote his bill HR 7972: that its provisions will be the framework of next session's legislation. The Jones bill authorizes the Secretary of Agriculture to put a processing tax of two cents a pound on lint cotton, and to put a compensating tax on competitive fibers if they get too much advantage as a result of the cotton tax; but it leaves market control, the emergency brake of the program, to the will of two-thirds of the growers.

Far-East War Effect Gauged

From TEXTILE WORLD'S *Washington Office*

The Far East war probably will not reduce Japanese imports of American and other raw cottons, or curtail Japanese cotton cloth and hosiery for export to the United States and other countries.

Textile goods being one of Japan's principal exports, the chances are she will make every effort to hold and supply her markets, so as to maintain exchange with which to procure war munitions and supplies. Military operations will not seriously interfere with Japan's textile industry, because the work is done mostly by women and children.

Of course there will be some question whether Japan can hold her markets. If some nations develop anti-Japanese feelings they may boycott her products.

Exports of American raw cotton to Japan are expected to continue along usual levels, or, in case of a long-drawn war they might increase substantially. Phenomenally increased sales would, of course, depend upon relaxation of this country's crop control program, which probably will be tightened under a new law next year. No one knows whether Japan is prepared with stocks of cotton-textile military supplies.

Already the President has stopped government-owned ships from carrying munitions of war to the belligerents. Commerce Department officials have already hinted that the Munitions Board might be called upon to decide whether cotton, sold in unusually large quantities to a country at war, becomes a munition. But even if cotton were declared a munition so far as China and Japan are concerned, either country could import it on their own or U. S. privately owned ships.

China last year had a large cotton crop, and this year has a bumper: 4,335,000 bales, compared with 3,741,000 bales in 1936. The war has brought trade and spinning almost to a standstill. Two-thirds of the country's mills are in Shanghai, mostly in the fighting zone, and many have been destroyed by shell fire. A few are still operating at 50% capacity. That third in the interior is thought to be in full operation. China's imports of American cotton are negligible.

Rayon Mills Reopen 3-Shift Issue

The mooted issue of two- versus three-shift operation in the rayon weaving industry came to the fore again in the New York market during recent weeks. Manufacturers were actively discussing the possibility of some voluntary action by individual firms which would serve to bring production into closer parity with demand. It was emphasized that the chief value of the discussion was that it enabled the industry to take the problem frankly into the open and thus supply an intelligent basis for subsequent steps, if any. It is understood that the two-shift rule has gained some important new converts but that resistance is still so strong as to render any early action on a wide scale unlikely. Meanwhile, due to continued slow buying, voluntary curtailment through shutdowns and change of shifts has reduced fabric output some 40%, it is estimated.

Rayon Identity Rules Proposed by F.T.C.

The stipulation that brand names can be used only when combined with the generic term "rayon" in identifying rayon merchandise, is one of the key provisions in a code of proposed trade practice rules for the rayon industry which the Federal Trade Commission made public Sept. 17. Explaining that the rules are tentative, the Commission set Oct. 8 for a hearing at Washington, D. C., at which opponents of the rules could air their views. The eight clauses of the code provide, among other things, for acceptance of the generic term "rayon," complete statement of fiber percentages in all descriptions of mixed goods, and a prohibition of misleading merchandising methods in any sort of rayon promotion, as well as the controversial brand name clause. On Sept. 16 the Commission held a hearing in New York at which yarn producers submitted an outline of rules for textile identification; 24 hours later these rules were rejected by the Commission without comment. With respect to the Commission's rules later submitted sentiment among producers indicated that, with exception of the brand name clause, most firms seemed ready to approve them in principle.

Amory Speaks at Distribution Meeting

Standards of living can be raised in America by more efficient production and distribution, and not by imposing uneconomic restrictions on either, asserted many speakers at the ninth Boston Conference on Distribution, held last month at the Hotel Statler with 500 delegates present from many industries and businesses. Co-operation between capital, labor, manufacturers, distributors and merchandisers formed a recurrent theme. From the textile industry, Robert Amory, treasurer Nashua Mfg. Co., presented a well-received paper on "Man Power and Distribution," in which he stressed the supreme importance of steady work as the only true social security, attacked the fallacy of artificial prices as an aid to stability of markets, and contended that "the only fair price is determined by the higgling between willing buyers and willing sellers."

Silk Marches On!

Merchandising forums stimulate interest in annual "Parade"

Official poster for Silk Week

STIMULATED by a build-up of merchandising and promotional activity which carried through virtually the entire summer, the Fourth Annual Silk Parade of the International Silk Guild, held during the week beginning Sept. 20, attracted unusually wide retail and consumer interest this year. Cooperating in the program were 9,000 stores whose promotion brought the message of silk to about 3,000,000 families from coast to coast. While no actual figures on sales were available, informal reports from retailers indicated that the event had served to greatly accelerate movement of all the chief silk merchandise lines.

One week prior to the opening of the parade, the Silk Guild held a Silk Dress Merchandising Forum at the Waldorf-Astoria Hotel, New York. This event, second in a series, was attended by some 500 leading retail executives from all parts of the country; it served effectively to quicken trade interest in silks and contributed materially to the success of the parade during the subsequent week.

The forum was conducted by Jay D. Runkle, merchandising counsellor; it followed the same plan as Mr. Runkle's July forum on silk piece goods. Termed "a meeting of the store for the store and by the store," the forum did no direct selling of silk as such, but concentrated instead on offering constructive suggestions to help retailers in the merchandising of quality dresses.

R. D. Jenkins, vice-president of the International Silk Guild, opened the forum and then turned the meeting over to Mr. Runkle who discussed the questions customers ask regarding dresses, including fiber content of fabric, wearability, fadeability, shrinkage, etc. The interview method, so effectively used by Mr. Runkle at the piece goods forum, was again employed and with equal success. Fiber identification was discussed in interviews on (a) "What the Customer Wants to Know," with Miss Julia K. Jaffray, leading consumer protagonist in the identification movement, and Mrs. Wilbur Fribley, president, American Housewife's League, and (b) "How to Put an Identification Program into Effect in the Store," with T. B. Blanke, of the National Retail Dry Goods Association, H. O. Bergdahl, Associated Merchandise Corporation, and Geo. M. Bersch, of L. Bamberger & Co. Dress merchandising was discussed in interviews with B. R. Michael, of Halle Bros., Cleveland, Sidney Ring, Saks 5th Ave., New York, Mrs. L. V. Harter, Bloomingdale Bros., New York. The forum was notable for its practical aspects; balancing dress lines, stress on quality in selling, personnel training, and knowledge of merchandise were among the points emphasized by speakers.

A novel fashion show featuring 300 fabrics draped on 50 life-size cut-outs of piquant figures was one of the forum's highlights. The fabrics were contributed by about 50 of the leading silk fabric mills, and they constituted a most lavish assortment of new fall and winter silks for every apparel use. The event concluded with a dinner at which Paolino Gerli, president of the Guild, presided; M. Marcel Rochas, French designer, was guest of honor and Miss Helen Cornelius, of *Harper's Bazaar*, spoke on style trends.

—And then The Parade!

Various features contributed to add interest to the Silk Parade; among these were: the current fashion emphasis on luxury, the consumer trend away from price and toward quality, and the nation-wide interest in the whole controversial question of fiber content. These, plus a "silk consciousness" which had been quickened by the pre-parade forum sessions combined to give the event a very vigorous send-off. Retailers were supplied with all manner of timely promotional material, including posters, display suggestions, copies of the various departmental editions of the Guild's "Merchandising News," etc.; the stores devoted most of their advertising space, direct mail, radio and other media to the event.

Novel silhouette style show at Silk Forum—Bouffant gown designed by Marcel Rochas using rich Roman-striped silk-and-metal fabric

The retail trade now has come to accept the parade as a standard part of the calendar and this year they began planning for it many weeks ahead. A notable point was that ready-to-wear departments participated more actively this year than ever before, Guild officials said. In requesting parade material, the retailers were especially insistent on getting information about textile fibers and fabrics. The window display contest has become a regular feature of the Silk Parade, and this year's event had attracted an unusually large number of contestants when entries closed at the end of September. All display windows featuring silk merchandise of any sort which tied up with the parade were eligible as entries.

Analyzing the results of the parade, Guild officials said that it had served during the last two years to start a trend toward all-year silk promotion by the retail trade. They explained that the impetus given silk merchandise during the annual September event was so strong that it focussed store attention on silk's possibilities for all-year promotion with the result that in many stores sale of silk merchandise in the eleven non-parade months had been appreciably stimulated.

N. A. C. M. Convention

Mixes legislation, glass, spun-rayon, machines, golf, clam-bake, style-show, to good effect

ENCOURAGEMENT to battle detrimental legislation, new light on spun rayon and fiberglass, a vivid picture of machinery progress, clarification of the third shift problem, etc., were brought clearly to the attention of a representative group of New England mill executives at the 83rd annual meeting of the National Association of Cotton Manufacturers, Providence - Biltmore Hotel, Providence, R. I., on Oct. 6 and 7.

The feature of the business session Wednesday morning was the offering of the report of the association's legislative committee by Fred W. Steele, chairman. He urged not only action, but uniformity of action, in opposing legislation detrimental to the industry. Mr. Steele said that in the last legislative session there were 15,000 bills introduced into New England legislatures and 10,000 introduced into Congress, most of which are combed by the committee. The Massachusetts law prohibiting the employment of women after 10 p.m. has been suspended, he pointed out, each year beginning with its suspension under the NRA regime, but it was uncertain whether it would be suspended for the ensuing year. The situation demanded attention.

Chairman Steele pointed out that the wage and hour bill will be first on the "must" legislation when Congress reconvenes. He mentioned the fact that the association was successful in getting a paragraph in the House draft of the recent Black-Connery Bill prohibiting the employment of women between mid-night and 6 a.m. thus preventing the third shift, an objective favored by the association, but that this paragraph was withdrawn by the House committee because of pressure brought by women's organizations all over the country. Opposition by the legislative committee to regional wage differentials was voiced by Mr. Steele.

The first session of the meeting was opened with a brief word from Governor Quinn of Rhode Island, welcoming the visitors and expressing interest in building up the textile industry in New England. Lincoln Baylies, presided at this session, after an opening word from Russell T. Fisher, president.

Mr. Fisher in his capacity as secretary offered the report of that office which was accepted as read. Similar action was taken on the reports of the New England Cotton Freight Bureau and the Cotton Committee.

The principal executive officers of the association were reelected. These comprise Russell T. Fisher, president; C. F. Broughton and W. F. Staples, vice-presidents. Added to the board of directors were Percival S. Howe, Jr., for three years; Robert L. Anthony for two years; Albert H. Crossman for one year.

Russell T. Fisher reelected president of N. A. C. M.

Resolutions on Wages, Hours

In the group of resolutions unanimously passed by the convention the association went on record with its views of matters relating to hours and wages legislation. One of these opposed the creation of a board or commission for the purpose of administrating the hours and wages regulations on basis that existing government bureaus could best do the job. Another endorsed the following principles: 1. A maximum work week for employees. 2. A minimum wage. 3. The elimination of the employment of women and minors between midnight and 6:00 a.m. 4. That all these principles shall apply without discrimination uniformly throughout each industry.

A GRAND JOB

The Providence convention of the National Association of Cotton Manufacturers was one of the best pieces of program-planning we have witnessed in the industry. It was 50-50 business and pleasure. The day devoted to business covered practically all the major developments which are stirring textile manufacturers today: industrial legislation, spun glass, spun rayon, textile education, machine progress. It was a well-balanced diet — and offered by authorities in each field.

The fun was equally tops. Golf and a clam-bake is a combination which is hard to beat.

Some conventions are just plain bores. This one was a wow.

— Editor.

Glass as a Textile

As a sort of cocktail before the session on "Modern Developments in the Textile Industry," Wednesday afternoon, the last item on the morning program — a talk on "Glass as a Textile" by J. L. Tucker, textile engineer with the Owens-Illinois Glass Co.—described one of the most modernistic developments of all.

Mr. Tucker had a combination of advantages as a speaker on this subject before this audience. He has a long textile background himself; he is a enthusiast and yet a realist on the possibilities of glass as a textile; he displayed a fine collection of samples; and he has the happy faculty of being able to talk in a conversational way.

He made it clear that electrical insulation and filter cloth are the most important outlets on which his company is working—and that, although he has made dress goods out of glass, there is no intention of pushing into that field now.

Nevertheless he gave the following impressive list of products for which "Fiberglas" is being perfected: cords, threads, packings, ropes, sleevings, tapes, webbings, filter cloth, awnings, curtains, draperies, screens, wall covering, interior decorations, special fabrics for industrial purposes, slivers, fabrics for insulation, conveyor belts, felted fiber products, and many novelties such as pads, table-covers, doilies and pictures!

His company is now ready to supply the glass fiber in limited quantity to textile manufacturers.

Spun Rayon's Future

The thrill which comes to anyone in the textile industry as he reviews the stirring technical developments of recent years was furnished in good measure by Alexis Sommaripa, manager of fabric development for the Rayon Division, E.I. duPont de Nemours & Co., whose talk on "The Future of Spun Rayon" was the first of the symposium Wednesday afternoon at which session K. B. Cook presided. Mr. Som-

maripa, referring to the spectacular growth in the use of staple fiber in the last few years, and to the possibility of further increase through the augmenting of women's wardrobes, he asked the pertinent question: "But why are we entitled to such an increase? Why should women augment their wardrobes on account of staple? What is new about it? Is it not just her old friend rayon, with the addition of a few whiskers?"

Yes, he admitted, but "these whiskers are significant." They satisfy a very important sense, namely the sense of touch, he explained, in that "they enable the production of a fabric approaching the feel of a luxurious, downy woolen."

Spun rayon, said Mr. Sommaripa, is an ideal mixer or diluent. Using spun rayon as a base, he continued, the textile expert might actually put at the command of every woman fabrics with the main attractions of woolens and linens, yet at the same time compatible with a modest pocketbook. A like situation, he believes, will prevail in fabrics for men's wear.

"I am glad I can conclude this talk on staple," he said in closing, "by the same statement with which I finished my speech on rayon at your convention 11 years ago. 'The surface has hardly been scratched yet, and great opportunities lie ahead.' But this time you have double opportunities, both as spinners and weavers. The rayon producer will make the fiber in any length, in any diameter, in any luster, for any spinning process. He will work with you on fabrics and finishes, but in the final analysis the responsibility of making good yarn is yours and the future of spun synthetic yarns is in your hands."

Textile Education

The program committee showed its good judgment by including a discussion of "Specialized Textile Education and Its Place in Industry" in the symposium on modern textile developments. The speakers were Prof. Zenas R. Bliss of Brown University, and Frederick M. Feiker, executive secretary of the American Engineering Council.

Prof. Bliss stated that there is no conflict between the textile schools on the one hand and liberal arts colleges and general engineering schools on the other. Why bother with colleges for textile education at all, he asked. For two reasons he asserted: (1) in good times the textile schools cannot turn out enough graduates to fill the demand; and (2) no business wants to be made up 100% of specialists, but needs some men with an outside viewpoint.

Following Prof. Bliss, Mr. Feiker—who conducted the textile education survey for the Textile Foundation—reviewed the many developments that have come out of the movement: regular meetings of deans of textile schools, coordination of teaching materials in technology, development of courses in textile economics, etc.

He expressed the hope that the men of the industry—responsible as they were for the starting of the schools—will see in the present development the necessity for finding ways and opportunities to take these young men into employ in such a way as to get the most for their special training in the industry. He emphasized particularly that textile education is essentially a cooperative undertaking between the institutions and the industry.

Machinery Progress Symposium

In the "Machines and Processes" symposium which closed the afternoon session, a trio of leading machine companies were represented. The subject taken by each speaker was the modern trend in handling the cotton fiber from opening through spinning.

The first speaker was Wm. McLeod Fraser, assistant general manager, H. & B. American Machine Co. "If we were to introduce a complete new line of machinery, designed and operated on an entirely different principle, there is no doubt there would be a tremendous response," he said, "but when developments are of such a nature that on the surface the equipment appears more or less the same as it has for many years, some mill men are somewhat prone to believe that there is no particular advantage in adopting such improvements."

Then Mr. Fraser went at some detail into modern developments in picking, roving, spinning and twisting, showing the great gains in performance which made it necessary for all mills to keep abreast of the times.

The next speaker, W. Frank Lowell, vice-president, Saco-Lowell Shops, Boston, reviewed fiber preparation from its start in the opening room and stressed the fact that it is "controlled draft" which retains the integrity of the mix, prevents the segregation of fibers, preserves the longer, strength-giving fibers which build up the break factor, and stops the bunching and plucking of the shorter ones—the result being better and smoother yarns. "Quality has been placed ahead of savings," said Mr. Lowell. "The function of better drafting is the production of more even yarn of higher breaking strength from a given cotton." He expressed the future aim of the machine shops as "developing machines which will allow the operative in charge to be free of all duties except that of keeping the machine in operation."

The third speaker, Robert J. McConnell, mill engineer with Whitin Machine Works, pointed out that from the beginning of the textile machine age to about 1920, the task of machinery manufacturers was to develop machines which would produce more and at the same time require less attention. Since 1920, tremendous changes have taken place in the direction of eliminating processes. He cited one-process picking, one-process drawing, high-production combers, as well as long-draft spinning.

"It almost seems that we have reached the limits as far as spindle speeds, length of traverse, and ring sizes are concerned," he said. "There is nothing on the horizon which indicates the possibility of a radical change in design or method. This makes it necessary to study intensively every possible opportunity for improvement."

The Banquet

The annual banquet Wednesday evening brought together over 400 members and guests. A colorful style show was presented under the direction of Catherine Cleveland, of the Cotton Textile Institute.

Russell T. Fisher, as toastmaster, spoke on the theme of the convention—"Progress through Modernization." He quoted Sidney B. Paine speaking before the N.A.C.M. convention of 1895 as saying "Let well enough alone is not the motto of members of this association." That was said 42 years ago, noted Mr. Fisher, and it holds true today. He pointed out the immediate problems of the industry involving legislation, tariff, etc. He stressed that control of production was of paramount importance; that the industry had been liquidated down to 24½ million spindles which produced normal cotton goods requirements on a two-shift basis. "If the tendency shown earlier in the year for some of the mills to operate on a three-shift basis increases, then the industry will face another painful period of liquidation."

William M. McLaurine, secretary of the American Cotton Manufacturers Association, was a visitor to the convention from the South. Called upon to speak at the banquet, he expressed his delight at being "up here with you New Englanders." He gave this stirring challenge—"We are all of this great textile industry. Let no petty difference ever keep us apart. I bring a message of hope and cheer and confidence that we can forever stand undivided."

Dr. Claudius T. Murchison, president of the Cotton-Textile Institute, said that although the present may give cause for concern, he saw four favorable factors to give courage: (1) That it is falling cotton prices which unsettle the goods market and not merely low cotton prices, and it is apparent that cotton must be at or near bottom and therefore close to a stable basis. (2) That the industry has held to its self-imposed standards of wages and hours, and that the third shift is being relinquished. (3) That we are in a period of the year when demand customarily picks up. (4) That no economist has yet stated that we are in for a major depression, and that it takes an extraordinary depression to curtail appreciably the annual volume of the cotton textile business.

Thursday was devoted to plant visits, golf and finally a clam-bake.

Southern Hosiery Manufacturers

discuss labor conditions and elastic-top patents at Asheville

LABOR CONDITIONS and the patent situation applying to elastic-top hose were discussed by the Southern Hosiery Manufacturers Association at its annual meeting held Sept. 10 and 11 at the Grove Park Inn, Asheville, N. C. Speakers included Earl Constantine, managing director of the National Association of Hosiery Manufacturers, and Dr. Julian S. Miller, editor, *Charlotte Observer*.

Urging the manufacturers to maintain a solid front with reference to dealing with labor unions, Mr. Constantine said that the mill which signs a "favorable agreement" with the union in order to receive special dispensations will suffer most in the long run.

The apparent successes which the union has met with in the North, he said, are due primarily to alliances between union leaders and local Government officials. Sit-down strikes, riots, violence and property damage in certain northern knitting centers would never have occurred had the authorities intervened properly in an effort to keep order. He described the Reading and Apex agreements, and developments and conditions which led up to them.

Mr. Constantine told of an interesting interview with Secretary of Labor Perkins, and concluded his story with a warning to manufacturers not to depend too much on the Government for assistance in settling labor disputes.

"Wages have not been an issue in the North," he said with reference to unionization efforts, "and will not be in the South. Full-fashioned wages are fully satisfactory in both sections."

Mr. Constantine closed his address with a plea for the manufacturers to avoid third-shift operation of plants.

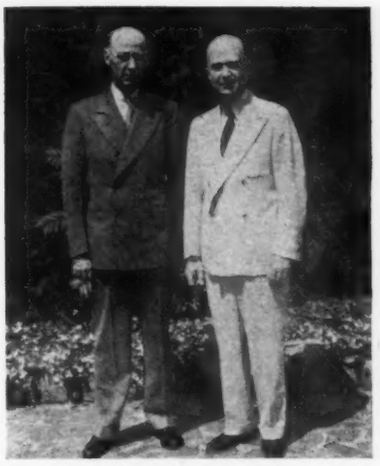
The second speaker on the Friday program was Dr. Julian Miller whose general topic was "America Comes of Age." He told the mill men to "set their own standards and stick to them, or the Government would do it."

The business meeting was continued on Saturday, the morning session being executive. The seamless industry was particularly interested in the afternoon session which consisted of a discussion of the patents and royalty claims on goods manufactured on multiple-feed ribbers with laying-in elastic attachments. A round-table discussion took place among owners of the patents, machinery manufacturers, and mill operators making hose by this method, followed by a closed session. Action was deferred, and a committee appointed to investigate further.

P. W. Eshelman, president and treasurer of Wilkes Hosiery Mills Co., North Wilkesboro, N. C., was elected president of the association, succeeding Henry T. Bryan, Jr., president of Bryan Hosiery Mill, Inc., Chattanooga, Tenn., whose term expired with this meeting. Floyd Dooley, treasurer and plant manager of Johnson City (Tenn.) Mills, was named vice-president and chairman of the seamless division, and J. H. McEwen, president of Grabur Silk Mills, Inc., Burlington, N. C., became vice-president and chairman of the full-fashioned division. F. Seifart, president of Hudson Silk Hosiery Co., Charlotte, N. C., was reelected treasurer.

New directors elected are Fred Kienel, Acworth, Ga., Carl V. Cline, Hildebran, N. C., J. M. Hatch, Belmont, N. C., W. P. Hardin, High Point, N. C., MacLin P. Davis, Nashville, Tenn., A. D. Crenshaw, Clinton, Tenn., R. L. Rayburn, Morristown, Tenn., J. T. Pollard, Galax, Va.

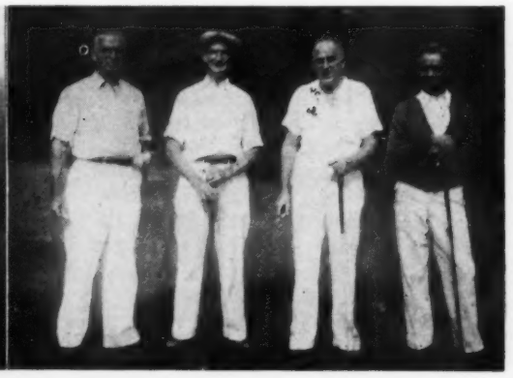
The remainder of the meeting was devoted to social affairs. F. Seifart won the low net prize in the golf tournament, and S. L. Diggle, the low gross. The banquet Friday evening was featured with music by the Harriman Hosiery Mill quartet, and was followed by a dance.



P. W. Eshelman, of North Wilkesboro, N. C., the new president of the Southern Hosiery Manufacturers Association, and Henry T. Bryan, Jr., of Chattanooga, Tenn., the retiring president.

Frank Shannonhouse, Sellers Mfg. Co., Charlotte, N. C., W. W. Griffin, Southern Franklin Process Co., Greenville, S. C., Hugh Merritt, secretary of Renfro Hosiery Mills, Mt. Airy, N. C.

Sam L. Diggle, Dixie Mercerizing Co., Charlotte, N. C., J. B. Frierson, Jr., Dixie Mercerizing Co., Chattanooga, Tenn., Henry T. Bryan, president of the association, Earle Constantine, director of the National Association of Hosiery Manufacturers, R. O. Huffman, treasurer, Garrou Knitting Mills, Inc., Morganton, N. C. (group at left)



R. D. McDonald, Chattanooga, Tenn., Walter Brockmeyer, Paul Knitting Mills, Pulaski, Va., R. L. Rayburn, Morristown Knitting Mills, Morristown, Tenn., H. S. Horrocks, H. Brinton Co., Philadelphia. (group at right)

Seamless Goes High-Style

Hosiery's transition marked by dramatic changes

IT IS doubtful whether any branch of the textile industry has undergone more fundamental change during the last decade than has the seamless hosiery division. Thanks to the increasing importance of style plus steady technical advance, this branch has experienced a transition so radical as to give it practically a new identity. For generations seamless hosiery has been a standardized line composed chiefly of staple products. Today this textile division, including its three major branches—men's, women's, and infants' and children's hosiery—is solidly established as a high style field.

The change has been more than dramatic. It has been revolutionary. Glance over the highlights of the modern picture and what do we find . . . The full-length ribbed hosiery for children—10 years ago a healthy substantial industry—now is just an incidental line which serves to keep machines going. In its place we have the up-and-coming infants' sox business . . . Women's silk seamless, long suffering from an inferiority due to lack of style appeal, goes knee-length—and presto! this division at once takes on a new vigor and interest . . . Even the conservative male is helping in the overthrow of tradition. His predeliction for gay design plus the growing popularity of half-socks, have transformed this sedate branch, composed chiefly of staples, into a high-fashion line of rapidly changing styles.

Varying consumer tastes, of course, are the underlying cause of it all. The changes in style have created many problems for both the hosiery stylists and the manufacturers of hosiery knitting equipment. These problems are being solved with an effectiveness that augurs well for profit prospects in the seamless hosiery field, as is manifest when we examine developments in the respective divisions.

Men's Hosiery

Deft work by the stylist in color combination, constant alertness by technicians to keep machines abreast of newest design trends, and the remarkable rise in popularity of men's anklets —these three phases combine to lend interest to the current situation in men's seamless. Here the whole picture reflects health and activity, with mills adjusting themselves quickly to new needs and conditions. Men's anklets are one of the big surprises of the post-depression period. Introduced less than four years ago, they now represent more than 40% of the entire men's seamless business, and many firms regard them as a permanent part of the business. Most anklets have elastic yarn tops and indications are this type of top will increase in importance. Knitters report that use of elastic yarn runs anklet costs above those of standard size half-hose; however, fashion interest serves to maintain prices and thus eases the competitive problem on this score.

The advent of high style in half-hose, while it was welcomed as a sales stimulus, created special difficulties. The sales-life of individual designs has been drastically curtailed; a design which, five years ago, would have continued selling for six months, becomes outdated in a few weeks. Buyers, who formerly would reorder three or four times on each number, now restrict themselves to a single order. Designs *must* be new! That, of course, serves to add importance to styling and mills focus closely on this function. The paramount call is for more and yet more variety of pattern. Ever since half-hose emerged from its humble state of plain colors, the trend has been constantly toward livelier shades and more intricate designs. The variety of combination, naturally, is limited by the versatility of the machine, and as the machine is constantly widening its range of patterns, we may look for steadily increasing style interest in half-hose. On the immediate horizon, one noteworthy feature is the growing domestic manufacture of English rib wool half-hose. Consumer call for this line, which was orginally created by the imported merchandise, now can be

THE ADVENT ***of high style in seamless hosiery a few years ago brought a complexity of critical problems to this textile division. How the division weathered and even capitalized on these problems is told in the accompanying article. The story is a tribute at once to the resourcefulness of the hosiery manufacturers and to the technical alertness of their sources of equipment***

filled by half-hose made on American machines. In view of the lower selling price, manufacturers expect the American-made English rib numbers to sell to a fairly extensive market.

Women's Silk Hosiery

Abbreviation seems to be one of the keynotes in seamless hosiery today. Even as half-socks zoomed up to big-volume popularity in men's hosiery, so too, knee-length stockings have risen from zero to represent about 50% of the women's silk seamless. The advent of knee-length, of course, has been the major styling development of the decade in women's seamless hosiery. It has transformed the stocking from a severely plain staple item to a gay and attractive high-style item. That might logically have been expected, as the knee-length development was a "natural" in stimulating style interest.

However, the increased attention to style has by no means been limited to the shorter stocking. Women's seamless hosiery generally has shared the advance. One notable point has been the progress of manufacturers toward giving seamless hosiery some of the advantages and appearance of the full-fashioned stocking. These developments include: improved fit, snugness, use of the gusset toe, square heel, loose welt, fashion marks, etc. The combined effect of this technical advance has been to greatly strengthen the sales appeal of women's seamless.

With respect to knee-length itself, there is no question but that this style has wrought a radical change in the manufacturing and marketing picture for most seamless mills. The 1937 knee-length seamless silk stocking is indisputably a thing of beauty. One of the leading high-style numbers, for instance, has a doubly decorative effect at the knees. It has, first, the standard elastic yarn webbing top, which itself is gracefully styled; below that top, however, there is also, as supplement, a jacquard lace top. This item is so attractive, so well-made and well-styled that, selling at 39 cents, the top retail price for seamless, it actually competes in fashion interest with some of the full-fashioned lines. Here, as throughout the entire knee-length hosiery field, elastic textile yarn plays a vital part. This yarn, which has done so much for the abbreviated stocking, promises yet wider fields of usefulness; elastic textiles are showing remarkable adaptability in new style effects and indications are that the styling possibilities of the elastic top in knee length hosiery are still far from exhausted.

Production of knee length hosiery has doubled each year for several years, and even today mills continue to install auxiliary equipment necessary for this operation. This aspect of the situation is causing some concern among more conservative mills. Certain manufacturers contend that the market is already over-capacitated; it is pointed out, not without reason, that a more cautious policy is needed, since any new style trend which would shorten dress lengths would seriously effect the demand for knee-length hosiery.

Interest in standard ribbed 5/8ths childrens hosiery is being revived this fall by introduction of elastic yarn tops (left, below). This is one of the 1937-1938 novelties in children's seamless. The two-pattern top, elastic yarn border above, and diamond design below (right), illustrates possibilities of the high-fashion trend in women's silk seamless.

Courtesy United Hosiery Mills Corp.
Courtesy Hanes Associated Mills Inc.

Infants' and Children's hosiery

The output of children's full-length ribbed hosiery today is one-tenth of what it was in 1927. Firms which had one or two anklet numbers in their lines in 1925, now do a business which is 97% anklets! Behind these two facts there lies the remarkable story of how the children's hosiery mills within a few years did a complete turnabout from knitting full-length ribbed stockings, a sedate, year-round staple, to knitting anklets, a kaleidescope of rapidly changing styles. What happened in the children's hosiery field illustrates more dramatically than any other development recorded in this article, the power and extent of the current high style influence in hosiery.

Since 1925, when children wore only the conservatively patterned rib stockings, the mills have gone through a transition which has compelled radical readjustment of policy and equipment. It is proof of the adaptability of this branch that the change was effected with comparatively few casualties. New equipment bought, new attachments added to existing equipment, up-to-the-minute styling departments installed—these changes were effected gradually through the years, and out of it has evolved a new industry. However, ribbed hosiery is by no means extinct. Numerous firms make both the anklets and the full-length ribbed lines. These firms report continued interest in ribbed hosiery and attribute this to two causes: (a) injection of high-style effects such as novelty tops, in three-quarter stockings; and (b) mothers prefer full-length hosiery to anklets for babies under one year because of the warmth factor.

Courtesy Interwoven Stocking Co.

Anklet vogue in half-hose interpreted in clocks and plaids

Styling represents a substantial cost item in anklet manufacture; it is higher here probably than in any other hosiery division. However, the attractiveness and variety of design achieved makes for active and steady buying at prices not too far below a reasonable profit level. Topical designs become more popular each season, and for all the limitations of the machine, knitters are able to develop designs typifying current interests such as coronation, comic strip characters, outdoor sports, etc., with surprising realism. Influence of apparel styles on anklets is evident in the present trend toward darker colors in anklets which is a direct reflex of that tendency in children's apparel. Here too, as in the other seamless divisions, credit is due to the elastic textile yarn industry for its contribution. Development of the elastic yarn has played a major part in the remarkable growth and success of the children's anklet industry, and today the great majority of these anklet lines have tops of elastic yarn content; the styling of the tops will continue to improve as the designers become more familiar with the broader possibilities of the elastic yarn in achieving artistic effects.

New Slashing System

. . . and some points on slashing and weaving in general discussed by Textile Operating Executives of Georgia

ALTHOUGH discussions of both slashing and weaving were on the agenda of the fall meeting of the Textile Operating Executives of Georgia, held Sept. 18, at Atlanta, the slashing discussion came first and, by including three prepared addresses and consuming most of the time available, all but stole the show.

Slashing Discussion

The principal address was by U. E. Dubois, of Saco-Lowell Shops, Boston, who discussed the new Co-ordinated Unified Slashing System. Mr. Dubois's remarks on this subject were, in brief, as follows:

"Let us assume that we have better-than-average section beaming. When the old machine was first designed, a 24-in.-diameter beam was common practice. Such a beam weighed approximately 470 lb. gross and was expected to unwind at an average speed of about 40 yd. per min. Since high-speed warping has become standard, the diameter of the beams has changed to 28 or 30 in., and the beams weigh approximately 725 lb. gross and are expected to unwind twice as fast. Obviously this condition could only be met with a new creel, properly designed and strengthened. Anti-friction bearings are necessary for two major reasons: first, to insure free rotation and, second, to obtain assurance of straight beam arbors. These special bearings, being lint-proof, are a safeguard against roughened or dirty open bearings.

"We advocate the use of double creels, when space allows, so that one creel can be filled while the machine is producing and the actual stoppage time can be reduced to a matter of minutes.

Stretch Control

"In the new system of slashing the sheet from the creel is drawn by a group of rolls at a predetermined speed in a dry nip which prevents slipping. This unit, known as the stretch control and feeding rolls, has been on the market for about three years and has been applied to a large number of existing machines. After many tests under all sorts of conditions, it became pretty well accepted that an average stretch of 1% to 1½% is about ideal in the slashing operation. Naturally, the overall stretch in gray yarns varies with the size of yarn, grade of staple, and twist. A reasonable average figure used so far is 6%, and it appears to cover more than the ordinary range of counts and conditions.

"We advocate cooking starch in small batches so as to provide a more constant blend of fresh size to prevent thinning while circulating through a closed loop. The size box itself has been made larger to allow the warp more time between nips after it has been immersed under a large cage roll, which allows the solution to flow on both sides of the sheet and consequently soak all yarns more thoroughly.

"We recommend the use of yarn-covered squeeze rolls. In our early trials we found that the speed was such that blankets did not appear to have a reasonable life; and the use of yarn covering, properly applied, showed savings of many dollars in the course of time. All rolls turn on anti-friction bearings.

High Drying Capacity

"In order to increase production, drying capacity had to be increased. Considerable research was made before the present design was adopted. Our aim was two-fold; namely, to improve quality and to obtain a higher productive rate. The drying unit in the new slashing system comprises four 5-ft. cylinders made of heavy sheet copper—new construction throughout designed for high peripheral speeds without vibration and able to operate at higher temperatures than before. By having four cylinders, there is an added benefit of graduated or differential drying, whereby a large percentage of moisture is driven from the core of the yarn. As the yarn passes to the finishing cylinders, the shell is sealed, binding all the fibers together and yet producing a yarn of remarkable flexibility.

"Experience so far has shown definitely that certain starches release their moisture more quickly than others, affecting drying speeds by as much as 25%. Actually, under identical mechanical and yarn conditions, production had to be reduced from a possible 250 to 200 oz. per min.

"In the new system, operating at higher speeds, it is necessary to provide means of removing a larger amount of moisture-laden vapors in a given period. As a result the cylinders are now completely inclosed in a specially designed copper hood with its own individual fan.

"The cylinders are positively driven, and self-releasing gears are used to insure uniform surface speeds of the yarn and cylinders. Here again, this prevents stretching the yarn to get a better hug on the cylinders.

Tension Control

"The head or delivery end of the slasher incorporates a new development in tension control. This is accomplished by the use of a New Departure Transitorq drive, which replaces the conventional plate or disk frictions. Tension in the yarn controls the pull on a dancing roll, which in turn controls the rate of delivery. This rate of delivery automatically adjusts itself so as to keep the tension on the drag roll absolutely uniform at all times while the beam is building up. At the start of each beam the Transitorq automatically returns to its starting point, giving positive assurance of uniform tension throughout each beam and matched uniformity in all beams. Cones have been eliminated in the main drive, and the new drive consists of a two-speed motor operating another Transitorq unit to provide a speed range."

More details concerning the variable-speed drive, and also the temperature-control system, will be found in the New Machinery and Processes department of this issue.

In the general discussion of slashing which followed Mr. Dubois's address, these points were brought out: Several mills figure 1½ to 2% stretch on 15s to 22s yarns, with one mill favoring ¾ of 1% stretch on 8½s yarn. With positive-drive creels on slashers, one member reported a 35% reduction in waste and considerable improvement in weaving; in addition the slasher speed was increased, and on some types of work looms were speeded up as much as 5%.

Starches

Preceding the open discussion of starches, Dr. Walter P. Schreiber, U.S. Department of Agriculture, outlined the researches on starches and warp sizing which is being carried out by the Bureau of Chemistry and Soils in conjunction with Alabama Polytechnic Institute. In his address, Dr. Schreiber

outlined the work which has been done on the development of a sweet-potato starch suitable for textile purposes; called attention to an experimental slasher, built at Auburn, which has a starch capacity of less than a pint, but gives results which check fairly closely with mill work; and mentioned the test and apparatus evolved for determining whether or not a warp has been properly sized.

Discussing the use of tapioca starch and sago flour in conjunction with cornstarch for slashing, one member stated that on denims he had not tried sago but had obtained good results with a combination of one-third tapioca and two-thirds cornstarch.

Size-Circulating System

In a short address F. S. Ward described a size-circulating system which is designed to counteract the thinning of the size during the running of a set. The heart of the system is a separate "blending" kettle to which fresh "cooks" of size are added in small amounts and at frequent intervals in order to compensate for the gradual change in the fluidity of the size as it is circulated and thus maintain a uniform condition in the size box.

The session on slashing was concluded by a brief discussion of methods to prevent stuck selvages during slashing. Suggestions included lining up of section beams to keep them from rising, having an off-set on the squeeze rolls, and maintaining beams in good repair.

Weaving Discussion

The weaving discussion, which concluded the meeting, was shorter than the slashing session. Following is a digest of the points brought out:

Wear on quill butts in the transfer is due to shuttle going too far in box, to quill being loose in battery, or to excessive vibration of battery. When pickers wear, shuttles can be kept in proper place by insertion of a small piece of leather at end of lay.

Grease guns which indicated amount of lubricant discharged are available.

Looms can be satisfactorily cleaned with compressed air. One mill, having only 0.25% seconds, uses 150 lb. pressure and blows off its plain-bearing looms every 24 hr. without covering them over. Water is kept out of the air by means of a large pipe designed to catch it. Looms are wiped off with cloth every 250 to 280 hr. Another mill blows off its looms when warps are out and cleans them thoroughly every 8 hr.

Harness from loom can be cleaned, prior to going to tying-in machine, by means of brooms, plus dull-edged knives for substances stuck on. Painting wooden parts of the harness will simplify cleaning and prevent warping.

Two-harness looms can be timed with shuttle at battery end if picking is over outside thread, as top shed is looser than bottom shed and will not hold as firm a selvage.

Long-draft yarn is more hairy than short-draft yarn and requires a higher starch content in the size to reduce shedding. An increase of 8% in the starch reduced shedding 50% in one instance.

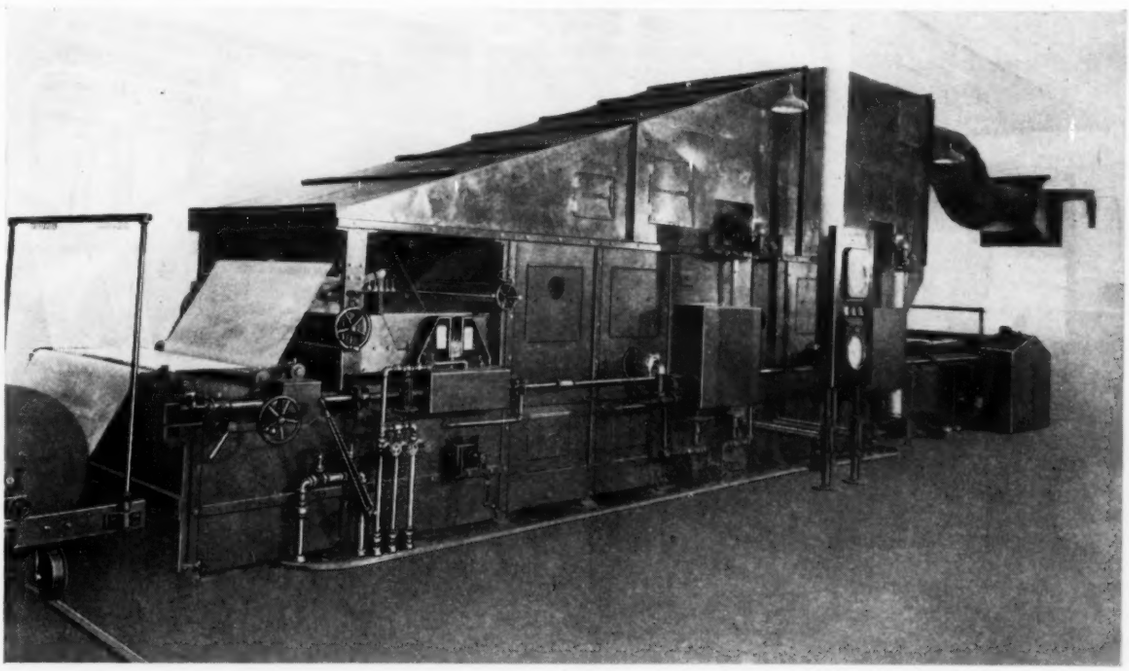
A bobbin-tip support helps to prevent filling breakage at transfer.

V. J. Thompson, of Griffin, Ga., was general chairman; and Messrs. Platt and Gibson led the slashing and weaving discussions respectively. Officers elected for the ensuing year are A. D. Elliott, of Trion, general chairman; Allen Jones, of Columbus, vice chairman; and Robert W. Philip, of Atlanta, secretary.

SACO-LOWELL'S HIGH-SPEED SLASHER — This new slasher, designated as Model 38, is the principal unit of the "Coordinated Unified Slashing System" described by U. E. Dubois in his paper at Atlanta. It will operate satisfactorily at high yarn speeds—100 yd. per minute, for example. Four 5-ft. cylinders give increased drying capacity while conserving steam, and special gears release cylinders from positive drive when yarn tension exceeds predetermined standard. The ordinary stuffing box and glands, as well as annoying leaks, are eliminated by new joints produced by Johnson Corp., Three Rivers, Mich., for handling steam supply and condensate.

The size vat is double normal size, and a 10-in. ribbed immersion roll facilitates penetration. Positions of the squeeze rolls, manufactured by Slasher Rolls Co., Boston, can be quickly reversed to prolong the life of the worsted-yarn coverings, which are applied by the McGann system and kept in condition economically by application of an additional layer of yarn from time to time. Manville Jenckes stretch-control arrangement, described in March, 1935, TEXTILE WORLD (page 124), is an important feature, as is also the magazine creel (May, 1936, page 116) with a new friction-release arrangement. The hood and exhausting system, built by Knowlton & Newton, Lowell, Mass., dissipate 15,000 cu. ft. of saturated air per minute.

Of particular importance is the head-end drive developed with the aid of Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., and employing the Transitorq variable-speed transmission built by New Departure, Bristol, Conn. The automatic, built-in temperature control is an adaptation of the well-known system developed some years ago by Taylor Instrument Cos., Rochester, N. Y. Roller bearings are provided by Hyatt Bearings, Newark, N. J.; ball bearings, by SKF Industries, Philadelphia; and chain drives, by Whitney Chain & Mfg. Co., Hartford, Conn.



Cotton Research . . .

Industrial fellowship at Mellon Institute reports progress

"Cotton is a dying crop in the United States. The shadows of decline lie upon it heavily."

That is the proposition. Research is the answer proposed by the Cotton Research Foundation.

PROGRESS reports are now being submitted monthly by the industrial fellowship established at the Mellon Institute of Industrial Research by the recently-formed Cotton Research Foundation, with headquarters at Memphis, Tenn. Naturally, these early reports are of a preliminary nature, since a good part of the initial job is to survey the ground. However, the subjects discussed in the August report, for example, indicate something of the scope of the research: New uses for cotton constituents; chemical composition and physical properties of cotton; biological-chemical aspects of the cotton plant.

It will be observed from the above list that the approach has been made from the standpoint of the cotton plant as a whole, and will cover every phase of cotton culture and wastage.

Where does the textile industry fit into this picture? The answer given the writer by Everett R. Cook, president of the Foundation, in Memphis recently was: Anything that research can do to return more per acre to the farmer means a reduction of the net cost of production, and proportionate assistance to cotton in its competition with paper and other products.

Referring to the work of the Cotton-Textile Institute, Mr. Cook said that out of the research work of the Foundation, he hoped, might come developments which would be subjects for promotion by the Institute.

In recognition of this inter-relationship between the Cotton Research Foundation and the textile industry, an Advisory Council has been appointed which will include several textile men. To date, Elliott Springs, president, Springs Cotton Mills, Lancaster, S. C., Donald Comer, president, Avondale Mills, Birmingham, Ala., Wm. D. Anderson, president, Bibb Mfg. Co., Macon, Ga., and O. Max Gardner, counsel for the Cotton-Textile Institute, Washington, D. C., have consented to serve. Additional appointments will be made later. Other members of the Advisory Council include prominent cotton shippers, cotton breeders, bankers, etc.

In addition to Mr. Cook, the officers of the Foundation include Oscar Johnston, of Scott, Miss., and Wm. H. Jaspoon, of Memphis, vice-presidents.

Background of Idea

Credit for the origin of the idea is given to David Cohn, of Greenville, Miss., author of "God Shakes Creation" and other books dealing with southern life.

The basic idea, as expressed in one of the Foundation's bulletins, was this:

Cotton is a dying crop in the United States. The shadows of decline lie upon it heavily. It may within a few years become a crop of secondary importance in the United States. The social and financial implications of such a change are so great they could affect the form of our government and change the face of America.

"Cotton growing is not declining because of lack of capital, labor or the exhaustion of fertility of the soil. It is declining for the sole reason that American cotton growers are losing both their foreign and their domestic markets."

"There has been a startling decrease in the use of cotton in the United States. The average per capita domestic consumption in the period 1910-14 was about 27 pounds. This fell in 1935 to about 20 pounds. If the 1910-14 average had been maintained in 1935, it would have resulted in an additional domestic consumption of 1,860,000 bales for 1935.

"In the period 1910-14 the average annual domestic consumption of cotton was about 4,868,000 bales. In 1935, a relatively prosperous year, the country used only 5,240,000 bales, an increase of 372,000 bales over 25 years ago.

"But the bald figures—as startling as they are—do not tell the whole story. The population of the United States has increased 40,000,000 since 1910. . . . These millions of people ought to constitute a gigantic market for cotton. But they do not."

The gist of it all is, concludes the Foundation, that cotton has been losing its domestic market in the last 25 years in the face of a growing population, increased national wealth and expanding industry. The principal reason isolated by the Foundation is that cotton has not kept pace with progress and is losing its market to the ever-growing competition from other fibers and substitutes. Particular emphasis is laid on the growth of the rayon industry.

The answer seemed to be obvious: research to develop new uses for cotton and its products.

Idea Becomes Actuality

After a preliminary meeting of 15 prominent cotton men and bankers in Memphis in 1936, a mass meeting was held at which about $20,000 was raised for missionary work. At first the plan was to build a research laboratory for the exclusive use of the Foundation. After careful study, however, it was realized that it would be impossible even to approach the facilities and personnel already in existence at the Mellon Institute. Hence, the establishment of the industrial fellowship there.

The project will require between twenty-five and thirty-five thousand dollars a year, which will be raised by national subscription from all trades related to cotton.

At Mellon Institute, L. W. Bass, of the general staff, is the adviser for this project, while industrial fellows assigned exclusively to the cotton research include D. M. Musser, R. F. Nickerson and H. S. Olcott. A senior fellow will be appointed later.

It is the hope and belief of the officers of the Foundation that important patents will be developed in the course of the work—and also that the Foundation will become a self-perpetuating institution. It is being planned with such a permanency in mind.

Hand vs. Machine . . .

An old story being repeated in cotton picking in the Delta

IN THE DELTA, they compete for cotton pickers. One morning last month, we were awakened at six o'clock by the sales talk from a truck stationed at a strategic point to intercept pickers on their way to other plantations. As bait, the "salesmen" offered base rates *plus* a barbecue. Other inducements offered elsewhere, we understand, included a drink of corn in the morning and another in the evening. We imagine that offer had its takers.

Then, too, there is the famous case of men standing over the pickers with shot-guns to prevent their "desertion." That pose has been photographed for the edification of tabloid readers in points North and East, with the inference that peonage exists in the Delta. As a matter of fact, we understand that those pictures were not genuine, but were posed by the photographer.

And, "around the corner" as it were, proceeds a development which may spell the end of these jobs which bring pickers out into the fields, with or without barbecue, with or without a drink of corn. We refer, of course, to the mechanical cotton picker.

In our short trip to the Delta, we were fortunate enough to see both of the principal mechanical pickers in operation—each within a few miles of Clarksdale, Miss., in the heart of the Delta. One is the Rust picker, developed by the Rust Bros. of Memphis, Tenn., and the other the International Harvester Co. picker.

The former, as our readers have previously been informed, works on the principle of the moistened spindle; the latter has a barbed spindle.

Each has been made self-propelled—an important advance. Each combines an all-purpose tractor with the picking mechanism.

At this stage, it is not too important to evaluate the advantages or disadvantages of the two machines. Mechanically, it is true, the Rust picker seems to have the advantage. Economically, the International picker has the edge, since the company is in the business of making "Farmalls"—and the new development might be described as more or less an attachment to its standard equipment.

But the mechanical picking of cotton is still in the experimental stage—and there may be other inventions which will eclipse existing machines. There is, for example, the application of the photo-electric cell, or "electric eye," mentioned in these columns last month—but still in the patent stage.

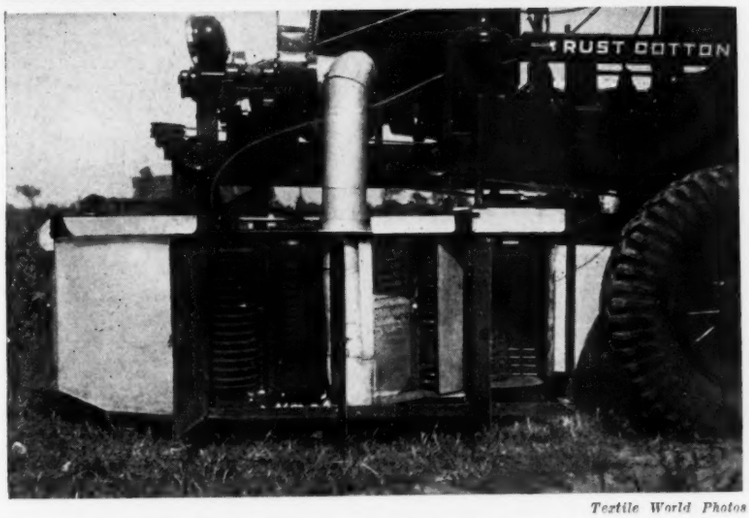
John Rust, whom we met in the Delta, believes that his picker has reached the commercial stage. So does the man who was operating the International picker. They claim to have overcome two main defects: incomplete picking and excess leaf.

As an observer, this writer is not particularly interested in the competitive status of these two machines. He feels that there is still something to be done before they will replace hand-picking on a commercial scale.

However, he also believes that the general substitution of mechanical picking for hand picking is only a matter of time. This replacement of hand labor by the machine has happened in practically every phase of human endeavor.

There is not yet the great social problem which all who know the South visualize in this revolution. It will come slowly enough, perhaps, to prevent violent social and economic disturbances—but quickly enough, we are convinced, to necessitate immediate thought as to the future of the cotton-growing areas.

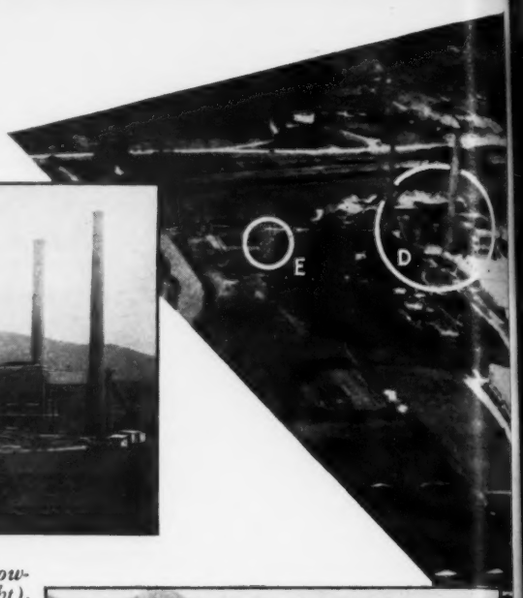
Once again we are in the midst of mechanization of a hand operation. It does no good to fight against it; it will merely do good to plan for it.



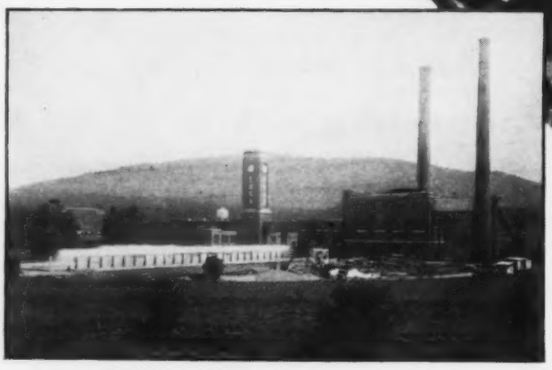
Textile World Photos

Above, the International Harvester Co. picker in operation near Clarksdale, Miss.; below, a close-up of the Rust picker, taken on another plantation near the same city. Both machines have been made self-propelled. The new Rust picker has double the picking units of the original one and is equipped with electric lights for night work

$1,000,000 Spent



Airplane view of entire plant as it appears today, with recent expansions indicated as follows: A, B, C—expanded manufacturing departments; D—expanded boiler plant and new stack; E—additional filter beds; F—Credit Union building; G—new gymnasium



General view of section of plant showing new spray pond, new stack (right), and enlarged warehouse

Rear of Credit Union building showing use of glass brick in construction

OF THE MILLIONS of dollars spent by rayon companies during the last year for modernization and expansion, one of the noteworthy programs of improvement was that of American Enka Corp., Enka, N. C. This company spent approximately $1,000,000 during 1936 in carrying further a program of growth and expansion which has been continuous since its organization in 1928. The way in which this money was distributed is extremely interesting. The majority of it naturally went toward increasing production and efficiency, but a considerable portion was spent in the interest of improved working and living conditions for employees.

Within eight years, American Enka Corp. has increased its production from an initial yarn output about 1,000,000 lb. yarn in 1929, the first half year of actual operation, to a present capacity production of well over 20,000,000 lb. annually. At the same time, the original line of bright 150-denier 32-filament yarn has been enlarged until today the company makes all lusters in sizes ranging from 100-den. 100-fil. to 300-den. 60-fil. This tremendous business expansion was made possible by (1) careful attention to production and management problems at the plant, and by (2) an aggressive policy of direct selling.

This article is not concerned with the merchandising history of the company, which is a story in itself, but rather deals entirely with a description of recent property improvements and some phases of the employee relation program in effect at Enka.

Building and Expansion

As can be seen from the airplane photograph, there have been a large number of construction jobs carried out at Enka within the last year or so. Probably the largest single addition was to one of the manufacturing buildings. Containing 100,000 sq. ft. of floor space, it is one story, of brick-and-steel, sawtooth construction. An architectural and safety feature is the glass brick windows beneath fire exits instead of regular windows. In addition to giving light, these windows are designed to prevent draft during a possible fire and make escape easier. Contractors were: McArthur Concrete Pile Co., New York, pile driving; Potter & Shackleford, Inc., Greenville, S. C., foundations; Ingalls Iron Works, Birmingham, Ala., steel work; Daniel Construction Company, Anderson, S. C., superstructure.

The boiler plant has been extended to accommodate a new 800 hp. boiler and an additional turbine of approximately 3000 kw. Other improvements include a new coal chute and second smoke stack. The latter is 250 ft. high, and built by the Alphons Custodis Chimney Construction Co., New York.

About $70,000 has been expended in extending the filter plant, and constructing a spray pond designed to cool water used in process work. Capacity of the filter plant has been increased from 5,000,000 gal. per day to 7,000,000 gal. An interesting feature of the water system is an underground 500,000-gal. tank constructed some time ago in which filtered water is stored. This is completely out of sight, and the land above it is landscaped in keeping with the treatment of the company's other properties.

Air conditioning of course is one of the most important manufacturing requirements in any rayon manufacturing firm, and Enka is always on its toes to take advantage of new developments in this field. Recently, Cooling & Air Conditioning Corp. equipment was installed in one of the textile laboratories, and Carrier equipment in the new textile departments. The employees' gymnasium is ventilated with Parks-Cramer equipment.

With increasing business of the last few years, additional warehouse space has been required from time to time. Recently, contract was let to Potter & Shackleford, Inc., Greenville, S. C., to construct a new warehouse for storage of pulp, costing $37,958. Another contract for $46,987 was awarded Daniel Construction Co., Anderson, S. C., for construction work on a general warehouse.

With reference to machinery, it is needless to say that adoption and installation of improved machinery for the manufacture of rayon have progressed rapidly since the plant first began operations. One of the outstanding changes in this direction took place in 1931 when the company added a pot-spinning plant to its original bobbin-spinning plant. Likewise, the company has developed and patented equipment and processes to improve bobbin-spun yarn for eliminating dyeing differences, and otherwise raise the quality of yarn.

Employee Relations and Benefits

One of the most interesting and important features of the Enka development is the constructive attitude of the management toward employee relations. Harmonious and enlightened labor relations have, for some years, been recognized by officials as one of the company's "fundamental obligations." Thousands of dollars are spent every year by the company in the interest of employees, but nothing is "given" them

Construction in process—new pulp warehouse

Employee gymnasium

at Enka

. . . improving plant efficiency and employee working and living conditions

in the strictest sense of the word. Enka is always ready to cooperate, but initiating the first move is up to the employees—in that there must be a genuine desire on their part for any sort of recreational or community improvement program before the mill takes a hand in helping out.

All organizations of employees which have cause to deal in any way with the management are encouraged to do so. Committees representing these organizations are always elected by the employees themselves. An excellent example of employee cooperation for mutual benefit is illustrated in the Enka Credit Union which was organized two or three years ago following the original Filene credit unions.

The Enka Credit Union, in brief, serves as a depository and savings bank for the employees, lending them money when necessary and protecting them from loan sharks. An employee can deposit any amount of money he wishes in multiples of 25c. until he has paid in enough to purchase a $5 share, or more. This makes him a member of the union, with the privilege of borrowing within certain limits upon the endorsement of two other employees of the firm, providing the money is to be used to better his financial status and not for extravagance. An employee may borrow money for hospitalization, to help finance purchase of house, automobile and clothes, to finance seed for farm, and, in fact, for almost any legitimate purpose. The money is paid back in easy installments of from $1 to $10, interest being the legal rate in the State for ordinary banking practices. The credit union is operated entirely by employees of Enka elected by their fellow workers. The company has nothing to do with the union beyond acting in an advisory capacity when necessary. The business of the credit union is carried on in a small office building recently built near the main office of the plant. It is constructed almost entirely of glass brick.

The Athletic Association is also an independent organization composed entirely of employees who elect their own directors. Members pay 25c. a month dues which go for the purchase of new equipment and expenses of the association. The company will match dollar for dollar any expenditures made by the association agreed to be beneficial to both workers and the mill.

The new gymnasium is a perfect example of how the Athletic Association operates. At the request of the association, Enka constructed a 110x130-ft. brick gymnasium, complete in every detail. Interest on the investment is paid by the association as rental. The rate is low. The building is two stories in front and one story in the rear, with facilities for a basketball court, tennis court, volley ball court, ping-pong tables, bowling alleys, billiard tables, etc. There are seating accommodations for 800 persons, and space for erection of many additional temporary seats. Lounging and parlor facilities are available for all types of social occasions. The library, consisting of 8,000 volumes donated by Asheville citizens for free lending, will be moved to part of the gymnasium designed to house it.

In one of the new sections of the main building, a large modern cafeteria for employees is being completed. It will contain the latest restaurant equipment, and is designed to accommodate 2,000 persons daily. It will be operated on a non-profit basis.

American Enka Corp. offers its employees plenty of opportunity to better themselves along educational lines, but nothing is compulsory. There are classes meeting one or two times a week which offer courses in 24 different subjects, such as elementary arithmetic, shop mathematics, foremanship, welding, chemistry, etc. The chemistry course naturally is one of the more important divisions of the educational system, and includes both elementary and advanced chemistry. The latter is limited to persons with college background or considerable chemical experience. Also, there are special courses in chemical processing of rayon, and in the spinning processes.

The Enka properties cover some 2,000 acres in a beautiful mountain setting near Asheville, N. C. The company is widely known for its modern village with brick houses of individual design, and for various natural and man-made recreational facilities which make life extremely pleasant for Enka workers. For instance, there is a 75-acre lake (used as a 300,000,000-gal. storage reservoir for process water) which is considered one of the beauty spots of North Carolina. It is surrounded with pleasant homes and gardens, and offers excellent facilities for swimming, boating and other water sports.

The entire mill and its surrounding community is a monument to Dutch intelligence and efficiency which have become completely adapted to American ways.

Loomfixer's Manual

COTTON SECTION — CHAPTER II

By Ivar Moberg

Take-up Motion

CHAPTER I *of the Cotton Section appeared in the August issue; and Chapter I of the Wool Section, in the September issue. Any reader who missed them may procure copies gratis, as long as the supply lasts, by writing* TEXTILE WORLD.

THE TAKE-UP motion on a loom serves to pull the cloth forward, and its adjustment determines the number of picks per inch in the fabric. There are two types of take-up motion in use; namely, the continuous or worm take-up and the intermittent or ratchet-pawl take-up.

The ratchet-pawl take-up is divided into two groups—the positive and the negative, or conditional. With the positive take-up the cloth being woven is drawn forward a predetermined amount for each revolution of the crankshaft; and a variation in the tension of the warp has, in consequence, little effect on the number of picks inserted per inch, although of course an increase in tension will cause later on an increased contraction of the cloth, resulting in a slight increase in picks.

The negative take-up is generally used in woolen weaving and in other fabrics where the filling is very uneven. Uneven filling is frequently encountered, for example, in the weaving of fabric from flax, hemp, or jute, for waterproofing purposes. In such fabric it is necessary that each pick be beaten up individually to give the maximum density possible. For instance, if the filling happens to be fine, the number of picks per inch is increased; and if it is coarse, the number of picks is decreased. Since the amount of take-up depends upon the amount of cloth forced forward by the beat-up of the reed, an even tension of the warp must be maintained to keep the cloth within the specified weight per yard. The number of teeth in the ratchet ring does not matter in this case, as long as it is small enough to take up the minimum number of picks per inch that the reed beats up. A negative take-up is not suitable for other fabrics than those of maximum density, as a specified weight is very difficult to maintain.

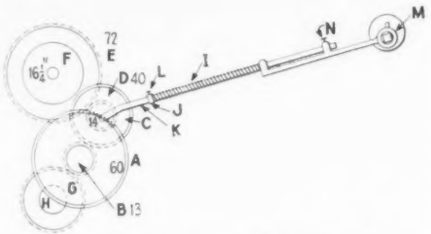
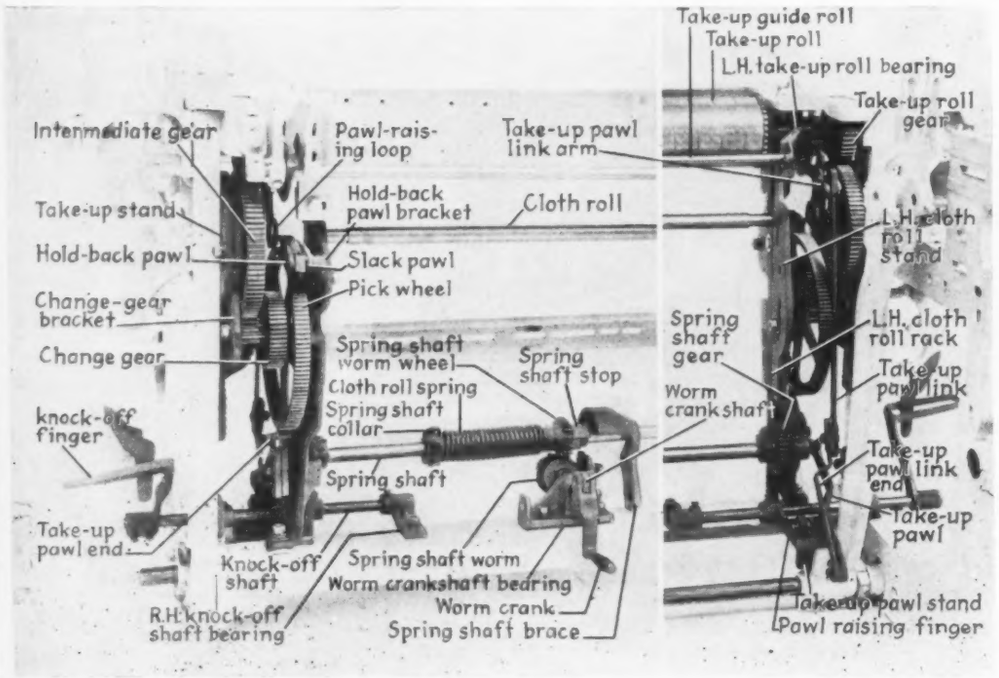


Fig. C4. Crompton & Knowles' diagram of a take-up which can be set for positive or negative operation.

Fig. C4 shows a take-up used on C&K woolen looms which can be either negative or positive, depending on how it is set. Ratchet *A* is driven by the take-up pawl *K*, which receives its reciprocating movement from eccentric *M* on the crankshaft. If the setting is to be negative, setscrew *L* is tight but setscrew *N* is loose. Consequently the drive from *M* to the ratchet *A* is through spring *I*; and if the resistance of the ratchet to turning is sufficient to compress the spring appreciably, the ratchet is not turned enough to let the hold-back pawl slip over a tooth. The take-up pawl must therefore remain under the same tooth until the fabric is built up sufficiently solid for the reed to push it forward and thereby momentarily release the tension on the cloth. The fixer can increase the pressure on the take-up pawl by moving the collar *J* up to compress the spring *I* further. To convert the take-up to the positive type, it is necessary to tighten setscrew *N*.

Fig. C5. Draper's spur-gear take-up motion applied to an E-model loom. (Photograph copyrighted, 1932, by Draper Corp., Hopedale, Mass.)



High-Roll and Low-Roll

Take-up motions can also be classified on the basis of high take-up roll and low take-up roll. In the former the take-up roll takes the place of the ordinary breast beam. Since with this type the distance between the fell of the cloth and the take-up roll is relatively short, the amount of contraction of the cloth is small. In some fabrics this is an advantage, while in others it is a disadvantage. With the low take-up roll the contraction of the cloth is greater, due to the greater distance between the fell of the cloth and the take-up roll. The latter arrangement is especially desirable in such fabrics as

corduroy and velveteen, in which the pile picks are cut. It is obvious that the more contraction that takes place from the reed width to the cloth width, the longer and fuller is the pile that results after the cutting, because the picks lie looser in the fabric.

The ordinary take-up motions have either five or seven gears in combination to reduce the movement of the take-up roll. Of these, the five-gear combination is by far the most universally used. As a rule the seven-gear combination is employed for high-pick fabric, but a five-gear combination in conjunction with worm and worm gear will also give a high pick—four picks per tooth of change gear. With the seven-gear combination, the picks are as high as 6½ per tooth of the change gear.

Take-up-Roll Covering

There is a great variety of coverings for take-up rolls, all intended to enable the roll to grip the cloth without undue slippage.

Of these coverings, the perforated tin is the most common and also the covering that is adaptable to the greatest number of fabrics. It is not, however, advisable to use perforated tin in the weaving of silk, rayon, and light cotton fabrics, as it has a tendency to pick up, cut, or displace the threads in such cloths.

The perforated tin is generally purchased in long, narrow strips and is wound in spiral from on the take-up roll. It is important that the perforated tin be wound on the roll under great tension. It is also advisable that each lap be tacked to the take-up roll in order that bulging under the strain of the cloth will be avoided. The perforated tin is a relatively cheap covering and should never be joined on the roll. Any joint or seam is likely to mark the cloth and form what are called "impression marks" every time it comes around. One whole, continuous strip should be used for each covering.

For very heavy duck and canvas, card clothing is an excellent covering, as its thousand upon thousand of fine needle points will grip the fabric and hold it securely without making impression marks. It is rather expensive and is rarely used on American looms.

For silk, rayon, and light cotton fabrics, strips of fine sandpaper or emery cloth are sometimes used for take-up-roll covering. These coverings should be glued to the take-up roll after the latter has been cleaned and freed from any lumps or protrusions. The glue must be free from lumps and sparingly and evenly applied to the roll before the covering is wound on. It is very important that this type of covering be wound on the roll under tension, else it will crack and form bulges.

Popular coverings in use today involve mixtures of cork with rubber and rubber-like materials, as well as abrasive-coated fabric covered by a thin film of metal. Crepe rubber is sometimes used for silk weaving but has a tendency to allow excessive slippage of the cloth. Sand, emery, or ground-glass glued in loose form to the take-up roll is not advisable.

Recently a new take-up roll covering which may be termed "rubber sandpaper" has been developed. This involves rubber in granulated form. It treats fine fabrics gently, prevents the cloth from slipping excessively on the take-up roll, and is long-lasting.

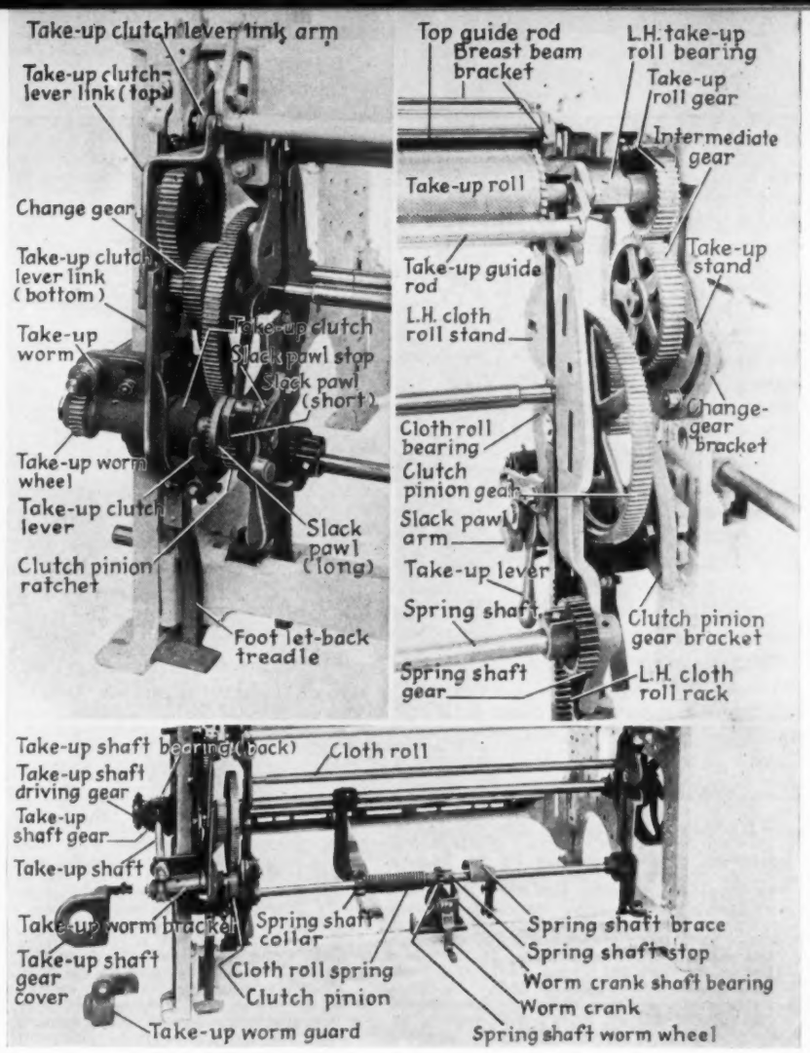


Fig. C6. Draper's worm take-up motion applied to an E-model loom. (Photograph copyrighted, 1932, by Draper Corp., Hopedale, Mass.)

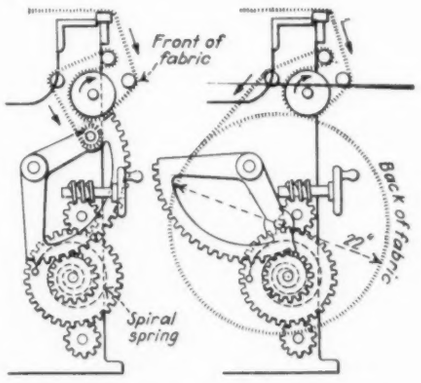


Fig. C7. Crompton & Knowles' diagram showing rising-roll take-up as applied to the C3-model loom

Setting of Take-up Motion

In the setting of the take-up motion, the take-up roll is first checked for level and free running in its bearings. The mesh of the gears is then adjusted so the clearance between the teeth is as small as possible without the gears binding. Most take-up motions nowadays have all cut-teeth gears, an advantage which should be preserved by using nothing but cut gears. The old cast gears are always more or less eccentric and produce an uneven pickage, although the average pick might be correct. The high side of the eccentric in a driven gear and the low side in a driver will produce a higher number of picks per inch than the average, and the reverse condition will produce a lower number of picks. A cast gear will also bind, or run heavier at certain points of contact than at others; and this will increase the torsion in the take-up combination and thus produce higher pickage than at the points of contact where the gears run freely.

If the take-up motion is of the ratchet type, the movement of the take-up pawl should be just enough to take up one tooth of ratchet plus a safety margin to allow for the difference in the spacing of the teeth in the ratchet and the increased torsion that may result from

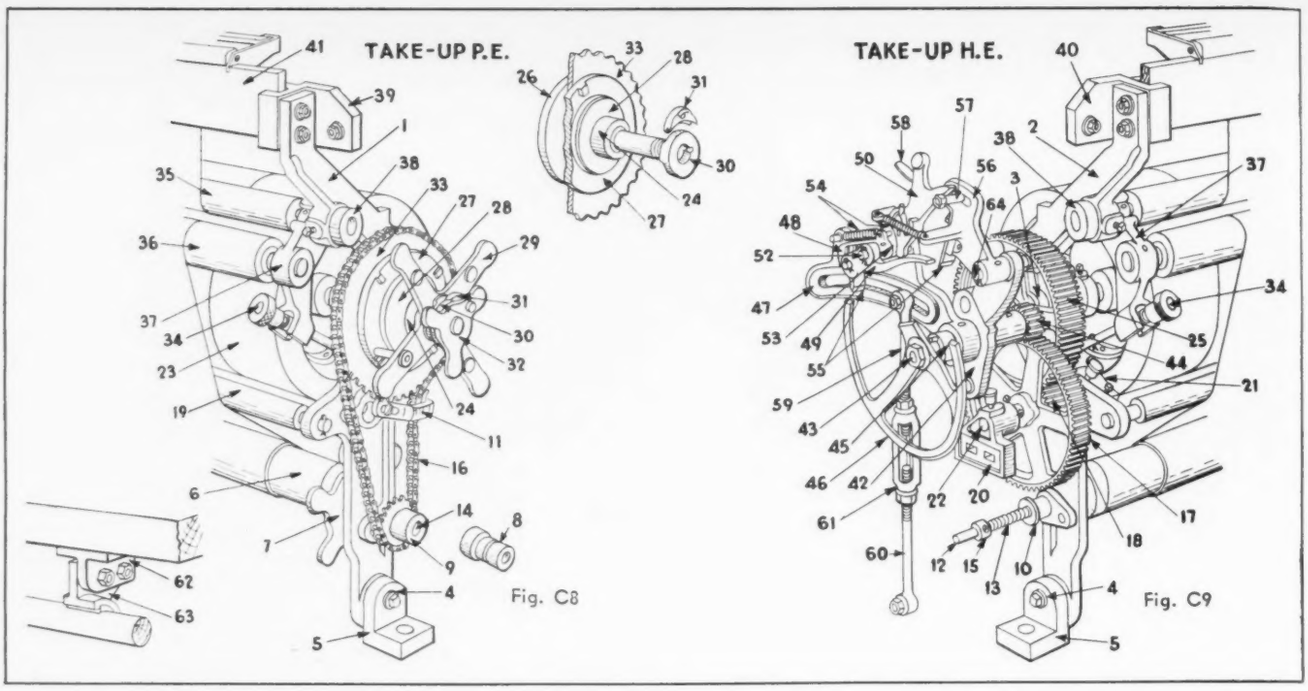


Fig. C8. Crompton & Knowles' diagram showing friction cloth-winding device in P.E. take-up. Parts designated are as follows: 1, take-up bracket P.E.; 3, take-up bracket cap; 4, take-up bracket foot bushing; 5, take-up bracket foot; 6, lower cloth roll; 7, hand-wheel on lower roll; 8, bushing for lower-roll shaft; 9, 17-tooth sprocket and hub on lower-roll shaft; 11, chain-idler arm; 14, lower-roll shaft; 16, sprocket chain (80 links); 19, spreader roll; 23, take-up drum; 24, space collar on take-up-drum shaft; 26, drive flange; 27, friction flange; 28, friction washer; 29, cam handwheel; 30, cam collar; 31, dog; 32, friction adjusting screw; 33, 52-tooth chain sprocket; 34, tension screw; 35, guide roll; 36, pressure roll, covered with rosella felt; 37, hanger; 38, slide bushing; 39, bracket stand; 41, breast-beam board and tray; 62, center-support stand; 63, center support. Fig. C9. Crompton & Knowles' diagram showing take-up H.E. Parts designated are as follows: 2, take-up bracket H.E.; 3, take-up bracket cap; 4, take-up bracket foot bushing; 5, take-up bracket foot; 10, plug in cloth roll H.E.; 12, pin in plug 10; 13, spring on pin 12; 15, collar on pin 12; 17, intermediate gear; 18, intermediate-gear pinion; 20, intermediate-gear shaft stand; 21, support for intermediate gear shaft; 22, intermediate-gear shaft; 25, take-up gear; 34, tension screw; 37, hanger; 38, slide bushing; 40, bracket stand; 42, ratchet stand; 43, ratchet shaft; 44, ratchet-shaft pinion; 45, hub for ratchet; 46, handwheel on ratchet shaft; 47, rocker arm; 48, take-up pawl; 49, pawl end; 50, pawl lifter handle on shipper shaft; 51, stud for pawl lifter handle (this stud is in shipper handle); 52, stud for take-up pawl in rocker arm; 53, space collar on stud 52; 54, spring for take-up pawl; 55, blade for pawl; 56, hold pawl; 57, collar on bolt; 58, flat spring; 59, driving rod (upper part); 60, driving rod (lower part); 61, turn-buckle; 64, stud in ratchet stand for hold pawl.

an increase of tension in the warp. The hold-back pawl should also be set so there will be some safety margin.

On one type of Draper take-up motion the cloth guide rod in back of the take-up roll is supported by adjustable bearings. In this case the guide rod must be checked for level; for if one end is higher or lower than the other, the cloth will be drawn out of square—that is, the filling will not lie straight across the cloth roll but run diagonally.

On take-up motions where the cloth is wound onto the cloth roll by the latter's contact against the take-up roll, it is important that the gears on the spring shaft, see Figs. C5 and C6, be so adjusted that they will hold the cloth roll in contact with the take-up roll by equal pressure of both ends. Failure of this adjustment results in telescoping cloth rolls and in curved cloth.

Setting Procedure

To set the cloth-winding mechanism of the Draper loom shown in Figs. C5 and C6, proceed as follows:

First see that the spring-shaft gear and the cloth-roll racks are free from lint and dirt packed in the teeth and that the racks run freely up and down. Adjust the spring-shaft gears so they will hold the cloth in contact with the take-up roll all the way across, and tighten up the setscrews. Loosen the spring-shaft collar and turn the crank clockwise until the spring-shaft stop prevents further turning. The crank should now be horizontal to the right. If it is not, loosen the setscrew in the spring-shaft worm and turn the crank until it is horizontal at the right; again tighten up the setscrew. The crank is now in the correct position so that it can be moved over to a horizontal position at the left and dropped into the holding notch at the left of the worm-shaft bearing. Now turn the crank counterclockwise two turns or more, depending upon the amount of pressure required on the cloth roll. Turn the spring shaft by hand until the cloth roll is up against the take-up roll; and, after taking out the slackness of the spring by turning the spring-shaft collar toward the front of loom, tighten up the setscrews in the collar. By turning the crank back until it stops, the proper pressure on cloth roll against take-up roll by the spring is obtained.

Fig. C7 shows the new Crompton & Knowles rising-roll take-up on C3 cotton looms. This cloth-roll motion permits the cloth to be rolled up to 22 in. in diameter. As the diameter reaches a certain size, the cloth will move backward toward the back of the loom and out of the way of the weaver. To remove the cloth, Crompton & Knowles gives the following instructions:

"Lift the pawl and turn the handwheel clockwise until the segment gear supporting the roll has rotated to its back position. Do not continue to turn the handwheel clockwise after the segments have reached the limit of backward movement lest the spiral springs housed in the spur gears be injured.

"To start a new roll of cloth, place the cloth roll in the supporting pockets of the segment gears and turn the handwheel counterclockwise until the tension of the spiral springs is sufficient to raise the roll and press it into position against the take-up roll."

Fig. C8 shows a C&K friction cloth-winding device with low cloth roll. Below Fig. C8 are given the various names of parts comprising this device.

Fig. C9 shows a C&K take-up motion, with the names of the various parts again given. The application of a handwheel to this take-up motion is a step in the right direction. All take-up motions should have a handwheel or crank by which they can be manipulated. More cloth has been soiled from weaver's hands which have been in contact with dirty and greasy gears than from any other source. Jammed fingers are also very common among the weavers due to the necessity of their putting their hands in among the gears to let back or take up the cloth.

In future instalments of Chapter II, to appear in early issues, Mr. Moberg will discuss take-up calculations.

The Way to Weigh

These drug-room rules prevent costly mistakes

By Samuel G. Newman

At first thought weighing of dyes seems to be too simple an operation to require discussion. But even in the "best" plants we have seen some slipshod methods used in the drug room. Although the rules drawn up by Mr. Newman are based on his experiences as a hosiery dyer, they are equally applicable in any type of dyehouse.

THE FACT that weighing of dyes is one of the most commonplace operations in the hosiery dyehouse often causes one to forget that it is also one of the most important tasks. The dyer or color mixer realizes that mistakes in weighing up a formula are costly—that an error in weighing may necessitate stripping a whole lot, with consequent waste of time, labor, chemicals, and dyes. But unless there is some system to the weighing of dyes, carelessness will creep through the drug room door. To insure accuracy in weighing, rigid rules must be set up, memorized, and then followed without deviation until they become thoroughly ingrained habits. The dyer should have the rules typed or printed, and copies of them should be given to every one who has occasion to weigh dyes at any time. The writer has found that the following rules, if respected, will do much to prevent mistakes in weighing. Additional rules may, of course, be needed to meet conditions in other plants.

1. Do not talk to any one while weighing dyes.

There is nothing that will do more to distract the attention of a man from his work and cause him to make a slip-up than the carrying on of a conversation.

2. At the scale or balance, concentrate on the weighing you are about to do; don't let your mind wander.

There is no time to think about last night's bridge game or about the trouble you are having with your car. When playing bridge, forget about the job; when on the job, forget about playing bridge. Otherwise you are inviting mistakes.

3. Before you start weighing, glance over the entire formula to see if it looks right.

The formula card or dye order should give the amount of goods to be dyed, the size of the machine to be used, and the color or shade of the lot, in addition to the dye formula. If the shade, for example, is a light brown, and the formula calls for three times as much black as the other dyes, or omits some dye which is ordinarily needed to obtain such a brown, a wide-awake man will easily detect this and check back with the original formula himself or call the matter to the attention of the man responsible. Perusal of the contents of the dye order card before weighing has saved many a lot from being redyed.

4. After the weighing of each dye in a formula, place a check mark against its name on the dye order.

This prevents the weighing of the same dye twice and lessens the chance of leaving out any dye called for in the formula.

5. Weigh each dye separately, instead of trying to weigh two or more dyes in the pan at one time.

In weighing one dye at a time you can easily remove the excess amount that may have been placed on the pan. When two or more dyes are in the pan. it is difficult to remove a portion of a particular dye from the pan to rebalance the scale without also scooping up parts of other dyes adjacent to it, and thus disturbing the formula.

6. Do not leave the balance for any reason until all the dyes in a particular formula have been weighed.

The habit of leaving the scale when only a part of the formula has been weighed has greatly contributed to incorrect weighings and errors. Upon returning to the scale, if you have forgotten to check off the last weighing, it is the easiest thing in the world to start weighing the same dye over again or to omit the next dye on the list.

7. Always keep the same dye in the same place.

This will help you to reach for the right dye in less time and with less applied effort.

8. Keep the scale clean and check its accuracy from time to time.

A scale that is not kept clean may become off balance; and if not inspected periodically, it will produce inaccurate weighings.

9. Do not weigh out any dye without a written order.

Adherence to this rule makes it possible to figure dyeing costs accurately. Also it protects you from being blamed for mistakes for which you are not responsible.

* * *

If the dyer himself does not make the weighings, he can do much to help his color mixer or other assistant. When writing the dye order, he should see that the names of the dyes and the weights of each are legible. Again, he should designate all weights in one system, such as all grams or all grains. The writer recalls an occasion when the formula and the subsequent additions of a particular dyeing lot had been made out in ounces and fractions of ounces. Then the dyer, needing but pinches of several dyes to obtain a good match, made out the final addition in grams and fractions of grams. The man at the scale, working mechanically, used ounce weights as in the previous additions. The result was that the shade came up too heavy and the goods had to be stripped and redyed. If all grains or some other uniform system had been used throughout, this would not have occurred.

Besides the following of rules, one must always apply common sense to the various conditions that arise in the dyehouse. For example, it may be necessary to dye a lot in a very light shade. If the amount of dyes required is only about 5 grains or so, the average scale is not accurate enough for such weighings. Better results will be obtained if four times the amount of each dye is taken, all dissolved in one pail, and then one-fourth of this strong solution used for dyeing. In tinting whites after bleaching the same principle should be applied. Make up a blue tinting solution to a certain known and recorded strength and measure out the desired amount in a graduate.

DRUG ROOM
Color Formula

Mach. No. 8 Date 4/5/37
Color Cuba Tan Style 301 (Silk leg / Cotton plait
Amt. 100 doz

Dyes	Weight - Grains	
Cotton Brown	536	✓
Cotton Red	154	✓
Cotton Black	110	✓
Silk Brown	1300	✓
Silk Yellow	375	✓
Silk Black	495	✓
Remarks:		

Precision Overhauling

Displaces grass lines, wooden straight-edges, and other obsolete equipment and methods

THE TREND in recent years toward precision operation of textile mills has resulted in the development of many unique devices and methods designed to increase efficiency. An outstanding example is the Guillet Overhauling System employed for lining, leveling, and conditioning frames. This system has now been applied in over 500 mills and thus has become an important influence in this trend toward precision.

In the past, erectors of mill machinery made out as best they could in leveling long machines, such as spinning and roving frames, with the aid of a grass line and wooden straightedge. It was practically impossible to do a good job with such instruments; and, to make matters worse, the floor would begin settling after installation, throwing the long frames even more out of alignment. The natural result was excessive strain on the various members, especially where joined, unnecessary wear on the moving parts, and a waste of power.

Seeing the need for a scientific method of erecting and maintaining in plumb the machines which presented these difficulties, A. M. Guillet, president of Dixie Spindle & Flyer Co., Charlotte, N. C., approached the problem from a new angle. He developed and patented a set of precision tools designed to level, line, and condition frames in spinning and carding rooms, as part of the mill's regular maintenance program. Machinery builders were quick to see the value of this procedure in erecting, as well as in maintaining, machines; and Saco-Lowell Shops adopted the Guillet system as an integral part of its erection program.

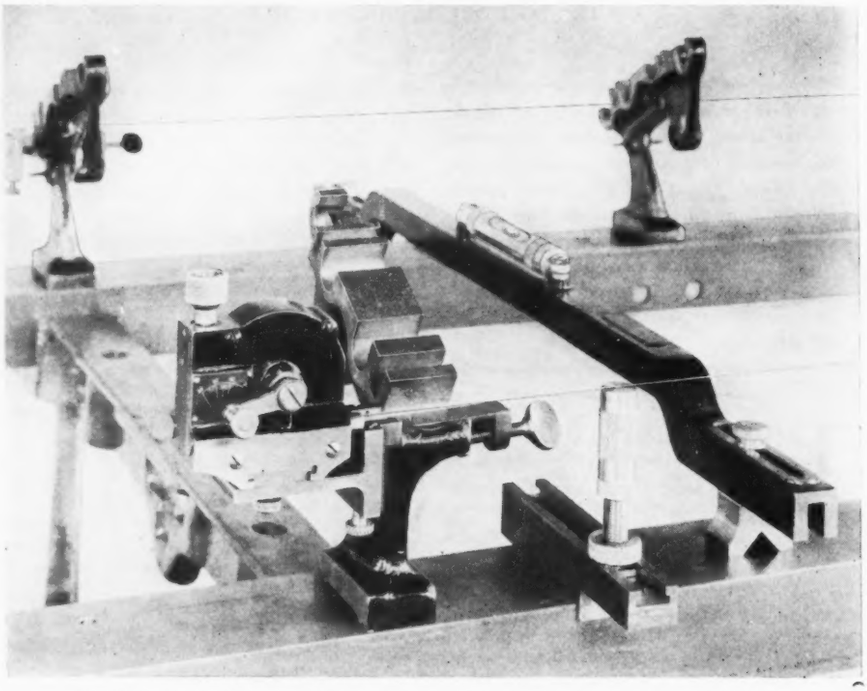


Fig. 1. Wire reel mounted on first roll stand, gage in place on roll beam, and level resting across frame

Fig. 2. Application of bar gage to one of the intermediate roll stands

Lining and Leveling

Since imperfect alignment is responsible for most of the wear on the parts of a long frame, it is logical to discuss this phase of the overhauling program first. The procedure in brief as applied to a spinning frame is as follows:

A special block is fitted into the front bearing of the first roll stand up to provide a bracket for securing a reel of high-tensile-strength steel wire, as shown in Fig. 1. This wire is drawn from the reel along the full length of the beam and the end secured in an anchor block fitted into the front bearing of the last roll stand. The wire is drawn taut by means of a small worm gear in the reel. A pointer on the side of the reel housing indicates the proper tension, which can be regulated for frames of different lengths. Adjustments in both the reel bracket and the anchor block provide for accurate positioning of the wire so that both ends will be the same distance from top and sides of the roll beam. This is determined by means of the gage shown resting on the beam under the wire.

With the wire thus accurately located over the beam, the beam is checked for level with the aid of a small ½-oz. level suspended from the wire. The relative level of the two sides of the spinning frame is next checked with the aid of cross levels at both ends of the frame; and a second wire is run along the roll stands on the other side of the frame in the same manner as on the first side. These two wires establish base lines from which to work.

The roll beams are leveled and lined with the aid of the same gage shown under the wire in Fig. 1. By the application of this gage along the lengths of the wires, the high points for both beams are located; and the beams are then brought up to this level and lined by adjusting each samson. When the work is finished, the gage just clears each wire at all points and also centers directly under it. The bar gage shown in Fig. 2 facilitates the lining up of all roll stands.

Cross leveling of the ring rail is very important. This is done by placing a level on the rail from front to rear and correcting any noticeable misalignment by removing the rail and filing the high spots. By means of other brackets, not shown in the illustrations,

the wire is applied to the box rail for proper alignment and checking of cylinders.

There are also brackets for applying the system to spoolers and winders. Other types of frame are checked and adjusted similarly to spinning frames, with the exception that different instruments or tools (included in the kit) are used.

Reconditioning in Mill

In addition to lining and leveling, the Guillet Overhauling System has complete facilities, which can be applied *in the mill,* to rework practically every part of any frame which is leveled and lined. For example, with reference again to the spinning frame, there is equipment to straighten crooked spindles, repoint blunt spindles, plumb spindles at top and bottom, set guides, straighten and adjust lifting rods, adjust rocker arms, and level ring rails, guide boards, separators, levers, etc.

Elaborating on the method of rehabilitating spindles, it is estimated that every year from 5 to 10% of the spindles in the average mill become bent or crooked so that they cannot be run at standard speeds. Bad spindles decrease production and increase cost due to excessive end breakage, high power and oil consumption, and wear on rings, travelers, and bolsters. Over 90% of these troubles can be eliminated, it is asserted, by straightening, repointing, and plumbing. The Guillet method of straightening spindles is, first, to test them by rotation in a bearing similar to the bolster; and then to utilize a composition hammer, special anvil, and system of tubes to work them back into line—instead of the old method of pressing back by leverage. A spindle-straightening machine, auxiliary to the standard kit, is shown in Fig. 3.

Though also not a part of the regular kit, a repointing machine (Fig. 4) can be secured by the mill and plugged into any electric-light socket. This device is said to repoint spindles without shortening them appreciably.

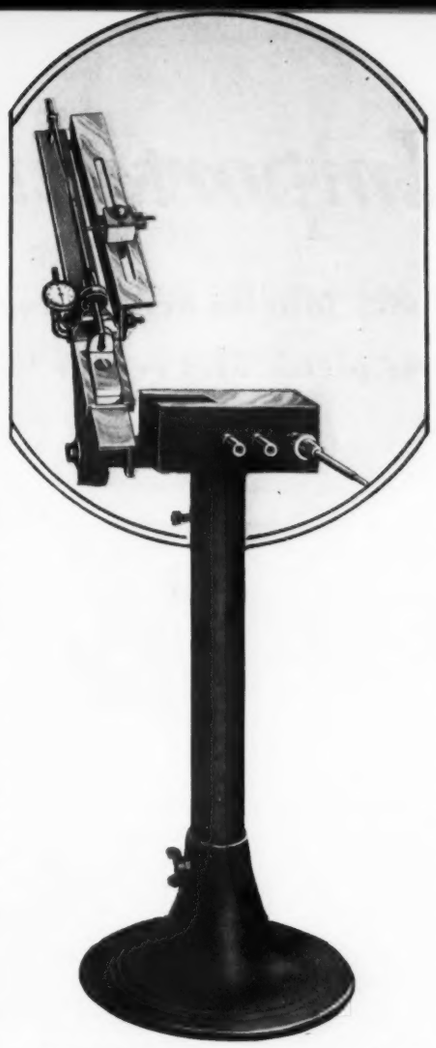


Fig. 3. Spindle-straightening machine which can be employed in the mill

Plumbing is carried out with the aid of special fiber plugs made according to micrometer specifications and designed to insure against splitting. These are furnished for all sizes of ring.

An integral part of the kit is a roll-spreading apparatus with jaws of three different sizes which will fit any standard-sized roll neck. It separates the rolls completely in one operation without the use of extra wedges or other contrivances. A direct pull eliminates the possibility of crooking or battering the rolls.

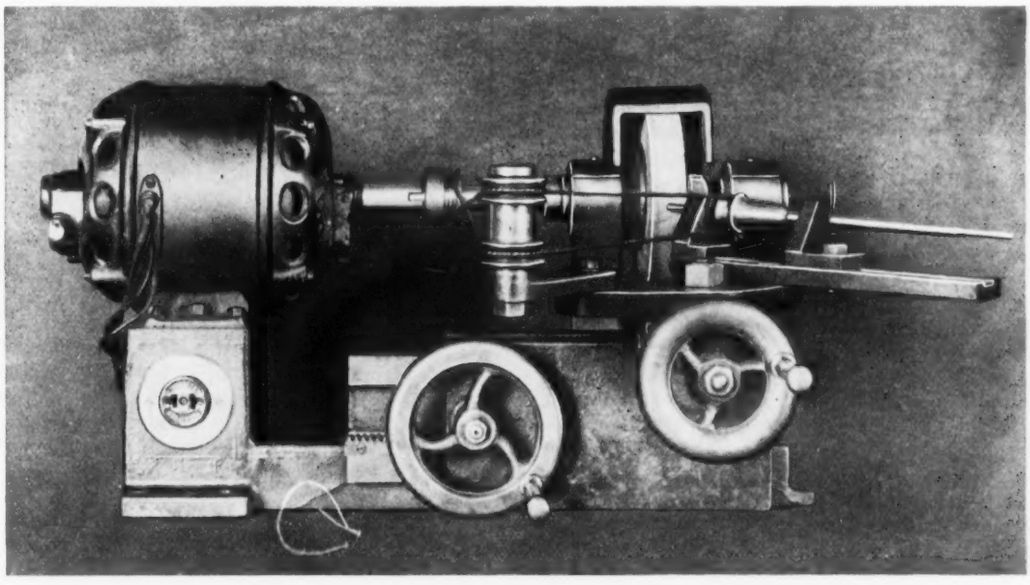
There are many other special tools and pieces of equipment included in the Guillet Overhauling kit which go toward making the service as complete as possible. Also, there are a number of other special machines, not a part of the kit but helpful in a general overhauling program, which can be brought into the mill when it is desirable.

Reconditioning Outside Mill

Of course there are certain types of textile machinery which cannot be easily reconditioned in the mill due to the complicated and heavy machinery necessary for the work. Work of this nature naturally is beyond the scope of the portable Guillet Overhauling System but can be done in the shop.

Worn drafting rolls are refluted and renecked by a special method said to overcome any potential danger of loose necks or swelling of the first boss. Flyers and pressers are checked at the same time the frames are being overhauled; and flyers are repaired completely in the shop by welding on new lugs, building up worn-out tube legs with steel, opening and closing slots to desired roving size, repinning, balancing and regulating the pressers, polishing, etc. Card-room spindles worn flat by flyers out of balance are reclaimed by a reversing and retopping process which brings the worn part of the spindle between the bolster and step, restoring the original bearing. The work calls for electric welding, machine forging, grinding, hardening, straightening, pointing, and polishing.

Fig. 4. Portable spindle-pointing machine employed in the conditioning service



Three Important Defects

In silk fabrics are pinheads, loose picks, and center loops

By S. C. Mahaffey

PINHEADS, which cause a fabric condition sometimes known merely as rough silk, are usually found on only one side of the cloth. They may be detected by a close observation of the cloth or by the moving of one's hand gently over the face of the cloth. Some of the causes of pinheads are the following:

1. Low spindles, high spindles, or spindles bent sidewise against the sides of the shuttles. Keep spindles on a level and perfectly straight at all times; otherwise the filling will come off with a jerk and the result will be pinheads.
2. Broken tension rubbers or not enough fur in the shuttle to prevent the filling from coming off too freely.
3. Loose heel bolt at plain side of loom will cause very thick patches of pinheads at that side of cloth.
4. Not having the proper check on the shuttles at either end (specifically, about 1 in. at box side and 2 in. at plain side). Causes much trouble, as the shuttles are allowed to enter and rebound enough to let the filling slack back.
5. Loom picking too hard from either end, caused by low lugs, by someone lowering the lugs to stop bang-offs, or by the use of too much sweep on either end, causing the shuttles to enter the boxes too hard and rebound.

Loose Picks

Loose picks are somewhat similar to pinheads, but they appear only at intervals—probably about ½ to 2 yd. apart. In working on loose picks, it is first necessary to ascertain on which pick the defect was made—whether on the pick coming from the box side or on the one coming from the plain side. Some of the troubles which cause loose picks are:

1. Too-hard picking from either end, causing an occasional rebound of the shuttle for only one pick, that pick being left loose as the cloth is beaten up.
2. A reed out of line causes plenty of trouble, as the shuttles will not travel true and loose picks are left as the result of the crookedly running shuttle.
3. High, low, and bent spindles causing the filling to jerk over the end of the cop at times.
4. Timing of the harness too early

will cause it to close on a pick of filling before the latter has been laid properly across the shed. Timing on dead front center is best, but a timing of ⅛ in. early is advised if possible. In the majority of cases, loose picks are caused on the pick entering the box side of loom and may be accounted for as follows:

Improper curve on steel binder or gum on binder.

Picker rod or picker slide in gummed-up condition. Keep oiled and clean at all times. Weavers instructed to oil four times daily and nightly.

Box-side heel spring too tight, causing picker stick and picker to be pulled back solidly against lay as shuttles enter, at times rebounding. Keep only tight enough to pull the stick back in place, and have check control it.

Filling has to travel in loose condition for 12 to 14 in. farther when it leaves plain side than when it leaves box side. Fur and tension must be so regulated as to take care of this.

Cut rings, pins, or porcelain eyes will also cause an occasional loose pick. Keep good ones in; there are always plenty on hand.

Cut filling wires will hang on a pick of filling, giving it enough of a jerk to cause it to be left loose for about 12 in. in the center of cloth. Keep them perfectly smooth.

Center Loops

Center loops are a serious defect and are very difficult for either a young or an old fixer to understand and handle at once. Center loops can most always be traced to the center filling stop motion. Usually it will be found that the filling feeler wires are holding the filling down as the reed beats the pick into the cloth. Some of the causes follow:

Defective picking because of reed not being aligned, bad pickers, etc., these defects resulting in crookedly running shuttles.

Early and late picking will at times cause center loops, because shuttles are thrown into filling feeler wires, causing them to snap down on the pick of filling.

Wrong check on shuttles, either too early or too late.

Timing of shed, either too early or too late, will at times cause center loops.

Shuttle tension causing trouble here may also be result of broken, loose, or tight rubber. Size of filling being used, however, must control tension placed on it. A tight rubber causes more trouble than a loose one in the matter of center loops, as the filling is allowed to pass through it with no pull on the rings to take care of slack when shuttle is checked. Be sure rings rise and fall gently as filling passes through them.

Worn-out fur causes plenty of trouble and must be attended to in accordance with the size of filling being used, as naturally a smaller thread, such as a two-thread or a three-thread, will require less tension than will a larger one of nine or even five threads.

Music-wire spring either tight or loose. If it is too tight, it will carry filling with filling feeler wires down through shed and leave loop on under side of cloth. If spring is too loose, it will snap down or fall in such an irregular manner as to cause small loops to show on both sides of cloth directly under center stop motion. Size of filling must also govern amount of tension to be used on music-wire spring. A very good rule, however, is to use four complete turns on spring. With this rule fairly good results are obtained with respect to loops and also with respect to proper functioning of the center filling stop motion.

Filling fork too low, allowing shuttle to strike it as shuttle passes under. Shed being too wide open will also let shuttle hit filling-feeler wires. Have from $\frac{1}{8}$- to $\frac{1}{4}$-in. clearance between feeder wires and shuttle, as shuttle is directly under wires.

Do not allow knock-off dagger to strike cam bunter (known by fixers as frog or knock-off dog) as it passes under bunter.

Also see that shield is held in place properly and that shield wire does not strike lay.

The French Comb

Beginning a practical discussion of exceptional value on details of its operation and adjustment

By John C. Lowe*
Lowell Textile Institute

THE FRENCH comb is designed to do a perfect job of combing wool. It is not only able to comb the entire length of every fiber which goes into the top, but it can also select noil with a thorough removal of neps and vegetable matter.

The vital feature which enables the French comb to do such good combing is the use of the nip. The nip enables a free end to be held in such a position that eighteen rows of pins, carried on a rotating cylinder, are forced to pass through the ends of the slivers (lap) held by the nip. These pins are graded as to length, size, and number per inch. The first row to penetrate the lap is the coarsest in the set; the eighteenth row is the finest.

Action of Cylinder

The action of the cylinder is less severe than it appears to be from the above explanation. In fact, the action is very gentle as compared to the treatment given to the wool on the Noble comb. The length of lap projecting from the nip when treated by the cylinder does not consist of a new length for each nip or cycle because of the following facts: (1) The length projecting varies according to the nip setting. (2) It is always greater than the length of lap fed per nip.

For illustration, let us suppose that the nip setting is 1 in. and that the feed is $\frac{1}{4}$ in. If the lap at the nip is started at zero projection, four cycles or nips will be required before the total length fed equals the nip setting and thus is long enough to be detached. The first $\frac{1}{4}$ in. of lap fed receives four cylinder treatments before it passes into the top. In like manner we have lengths which have received three, two, and one treatments by the cylinder; and it is noted that the critical part of the lap is that length immediately near the nip. Indeed, this is the weak point of the French comb, and this fact is generally ignored. Proper treatment of the new length, fed each nip, becomes of first importance and is controlled as follows:

1. By the setting of the nip to the cylinder pins.

2. By the correct pinning of the segments.

a. Finisher segment must contain pinning fine enough for the wools being combed.

b. The pin points along each strip must be parallel to the nip. (There must be no bow.)

c. All strips must be set so that the points of the pins in each strip are concentric to the cylinder center and equidistant from the front line of the nipper.

3. By the proper adjustment of the dab brush which holds the lap against the cylinder.

4. By intelligent use of the bur knife.

To comb the entire length of each fiber in the top, it is necessary that part of the fiber just treated by the cylinder be recombed. To complete the combing, the end of the lap treated by the cylinder is gripped by the detaching rolls; and immediately the top comb, which carries one row of pins, is lowered into that portion of the lap already combed by the cylinder. Conditions are such that the following statements are true, as easily proved by the diagrams in Figs. 1, 2, and 3:

1. The greater the length of feed, the less will be the recombing possible by the top comb, because the top comb must be set farther away from the detaching rolls to allow for the forward movement during feeding.

2. The greater the length of feed, the more severe will be the action of the cylinder; and the cylinder will do less recombing, because there will be a reduction in the number of zones recombed by it.

3. The greater the nip setting, the greater will be the length recombed, not only by the cylinder but also by the top comb. It is important to notice that an increase in the nip setting will also increase the free length from which the cylinder selects noil. Noil will therefore be increased.

The man who is responsible for the efficient handling of French combs is interested not so much in theories or analyses of the mechanism as in what conditions are necessary to produce good results at the comb.

These conditions may be divided

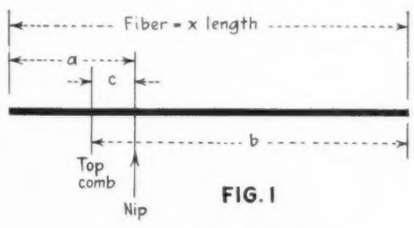
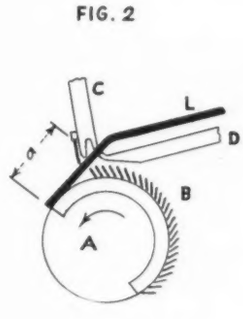
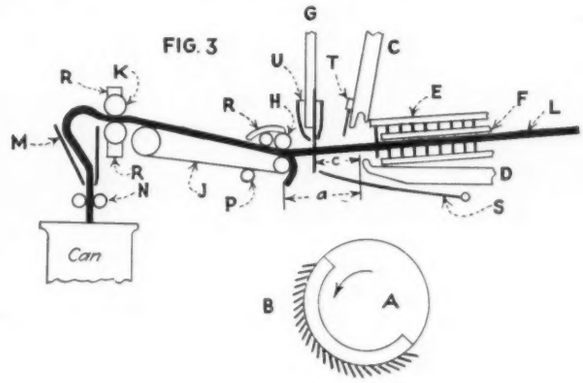


Fig. 1—In order that the full length of the fiber will be combed, part of the length must be recombed.





A - Cylinder
B - Segments
C - Top nip
D - Bottom nip
E - Feed comb
F - Feed grate
G - Top comb
H - Detaching rolls
J - Apron
K - Drawing-off rolls
L - Lap
M - Condenser
N - Press rolls
P - Lint roll
R - Rubbers
S - Shovel
T - Dab brush (fastened to top nip)
U - Top-comb bur knives

Fig. 2—Noil removal, first part of combing. To select noil and keep it at a desired minimum percentage, the end from which noil is selected must be free and adjustable as to length. The length a *in Fig. 1 can be controlled in the French comb so that noil is really selected.*

Fig. 3—Completion of combing. Notice length c. *Detaching rolls* H *are adjusted to nip* D *to control length* a*—that is, to control noil percentage.*

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under several heads: (1) condition of the stock, (2) atmospheric conditions, and (3) comb settings. In addition, he values experience and so becomes keenly interested in the causes of bad work and the remedies. A brief, but far from complete, discussion of these conditions will probably be helpful.

Condition of Stock

The wool going into the comb should be well carded. It should contain a minimum of neps and vegetable matter, and the vegetable matter should be in very small pieces. The sliver should be efficiently gilled with three gillings on intersecting gill boxes using as high draft as is possible. Before combing, a higher draft may be safely used than the same wool will stand when combed. A total draft of 420—about $(7.5)^3$—is required to obtain minimum noilage from any comb. This is not theory but is the result arrived at through tests.

Good piecings are vital on all gill boxes, and especially is this true before the French comb. Any lumps, slubs, large burs, and loops play havoc with the pins of the fine segment of the cylinder. Large burs may cause the nips to be held apart with reduction of pressure. In addition, the cylinder pins may strike against the projecting bur with disastrous results.

Every worsted card should be equipped with efficient bur-removing and bur-crushing devices. The wool should contain the proper amount of moisture and oil. Some mills card "dry" (no oil is added), but best practice seems to be to add oil before the wool is carded. This is sprayed on the wool as it leaves the dryer after scouring. Exhaustive tests have indicated, both here and abroad, that maximum benefits are obtained when not over 2% of olive oil is added.

The moisture content is vital, because it increases the extensibility of the fibers—they stretch rather than break. Wool entering the French comb is said to comb better when it contains from 18 to 20% of moisture. This amount of moisture also facilitates gilling; and in order to prevent quick dissipation of moisture, it is necessary that atmospheric conditions be suitable.

Atmospheric Conditions

Both temperature and humidity in the combing room are important. Room temperature is vital in that machine temperatures are affected by it. No machine used in worsted-yarn manufacture should be cold to the touch. In the French system throughout, safe temperature conditions exist around 75° F. Air can be quickly raised to correct temperatures; but cold machines, due to their specific heat, require a longer period of time to become warm enough. Cold machines will cause an increase in flyings, brushwaste, and laps. In addition, the end will not be so smooth.

As regards the relative humidity, we cannot quote a better authority than the late Mr. Hartshorne. As the result of exhaustive tests made in the Arlington mills, he made the statement that "the best conditions, for processing, exist when the wool in process is slowly yielding up its moisture to the air, rather than absorbing it." Suppose the wool at the comb contains 18% moisture; then, for the wool to yield its moisture slowly, the relative humidity must give a wool regain below this. A temperature of 80° F. with a wet-bulb reading of 73.9° F. gives a depression of 6.1°, and the relative humidity will be 75%. A temperature of 80° F. and a relative humidity of 75% will give a wool regain of 18.2%; while 75° F. and 75% r.h. will give a wool regain of 18.5% (18.5% regain is equal to 15.6% moisture content). The above conditions are good for fine wools. For coarse wools slightly lower temperatures and lower humidities cause "the work to go better."

In the next instalment of this article, to appear in an early issue, Professor Lowe offers an exceptionally practical and useful discussion of machine settings.

Staple Cotton Fabrics

Waffle Cloths

By John Hoye

Fabric Technician with W. Harris Thurston, New York

The twenty-second instalment of Mr. Hoye's series of articles on staple cotton fabrics includes a discussion of waffle cloth. The first article appeared in January 1936.

WAFFLE cloths are woven with a honeycomb weave, which gives a waffle or honeycomb effect. They are made in both carded and combed qualities and are woven on dobby looms, usually requiring ten or more harnesses.

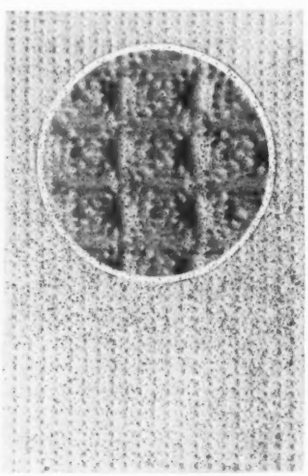
The fine-yarn cloths are woven with a small honeycomb or waffle design and are used for dress goods, etc. The term *waffle piqué* is sometimes applied to these finer cloths. This is in error, because there is no resemblance to the piqué weave. The heavier and usually ply-yarn cloths in widths of 48 in. and over are made with a large honeycomb or waffle effect and are used for draperies, coatings, etc. Another similar weave, known as the *birdseye waffle*, is also used on these heavier cloths. Some of the drapery waffle cloths are made with tinted yarns, to resemble unbleached linen, and are used in the unbleached state for heavy drapes, wall coverings, etc.

Finishes used: Usually plain finished. The lighter-weight cloths are often mercerized and sometimes preshrunk.

Uses: Women's summer coats, women's and children's dresses, skirts, jackets, etc., draperies, etc.

Yarns: 30s to 40s single yarns, 7/2 to 20/2 ply yarns, carded; 40s to 50s single, combed.

Examples of waffle cloths: 37″ 96x84 3.75 yd.—single yarns carded, 38″ 48x48 2.20 yd.—ply yarns carded, 54″ 52x52 1.55 yd.—ply yarns carded, 58″ 48x48 1.27 yd.—ply yarns carded, 58″ 28x28 .85 yd.—ply yarns carded (*birdseye waffle*), 38″ 108x84 3.90 yd.—single yarns carded, 40″ 52x52 1.90 yd.—single yarns carded, 37″ 92x96 3.67 yd.—single yarns combed, 39″ 108x84 3.90 yd.—single yarns combed, 40″ 133x112 3.35 yd.—single yarns combed.



Reeves Bros., Inc.

Waffle Cloth (Finished) Gray: 40″, 133x112, 3.35 yd., combed

Superposed Turbine

Will permit textile mills to meet increased demand for steam and power

By N. T. Pef

SUPERPOSITION, by which is meant the addition of a high-pressure boiler and turbine to the existing power plant, accounts for a large part of the increased capacity obtained by central stations in the last two or three years. To meet increased demands for steam and power, a few textile mills have already installed superposed plants, and many more are bound to do so in the near future. On the other hand, while practically any central station operating at steam pressures prevailing ten years ago or earlier will find that superposition offers a solution to the problem of how to increase capacity, the same thing cannot be said of the textile power plant. In the textile mill the process-steam requirement is usually the deciding factor for or against superposition.

For the purpose of determining whether or not superposition is applicable, we can divide textile power plants into four classes as regards balance between power and steam load.

In the first group are power plants that have a rather good balance between power and steam load. No exhaust steam is wasted because of excess and practically all of the process steam is byproduct from power. A power plant in this category does not favor superposition unless there is to be an increase in the power load and no, or very little, increase in the steam load, or unless a market can be found for the excess power.

In the second group are plants that have a heavy steam load and a relatively light power load. Such plants not only use all of the steam bled and exhausted from the engines and turbines, but in addition use large amounts of live steam. Here again superposition is out of the question unless the excess power is marketable.

In the third group are plants that have a large power load and a small steam load. Plants of this class usually generate part of their power condensing or/and they may discharge to the atmosphere a small or a larger amount of the excess exhaust steam. A plant in this group will find that considerable economies can be brought about by superposition.

In the fourth group are plants in which the power and process steam loads are balanced as in the first group, but with the difference that most of the processes call for high-pressure steam. The older of such plants use live steam for their high-pressure processes and most of their power is either purchased or generated condensing. Plants of this class are favorable to superposition.

As an example of what superposition will do, let us take a hypothetical plant from the third group. The power load of this plant is 5,000 kw. generated by two machines of 2,500 kw. each, one being operated condensing and the other non-condensing. The process steam load is 80,000 lb. per hour, 60,000 of which is the exhaust at 10 lb. from the non-condensing machine and 15,000 is live steam at 200 lb., which is the operating pressure of the plant. This steam is de-superheated from 600°, at which temperature the steam is generated. The condensing machine uses 40,000 lb. of steam per hour, making a total of 120,000 lb.

To increase the capacity of this plant there is superposed a boiler delivering 120,000 lb. of steam per hour and operating at 750-lb. pressure and 950°, together with a 4,000-kw. turbine. All of the high-pressure steam will pass through the new machine, which will discharge at 200 lb. and 600°, which is the condition of the steam formerly generated. Some of this steam will be used in the high-pressure process, but the main portion will pass through the other two machines and will discharge at 10 lb. as formerly. The condensing machine will be operated non-condensing.

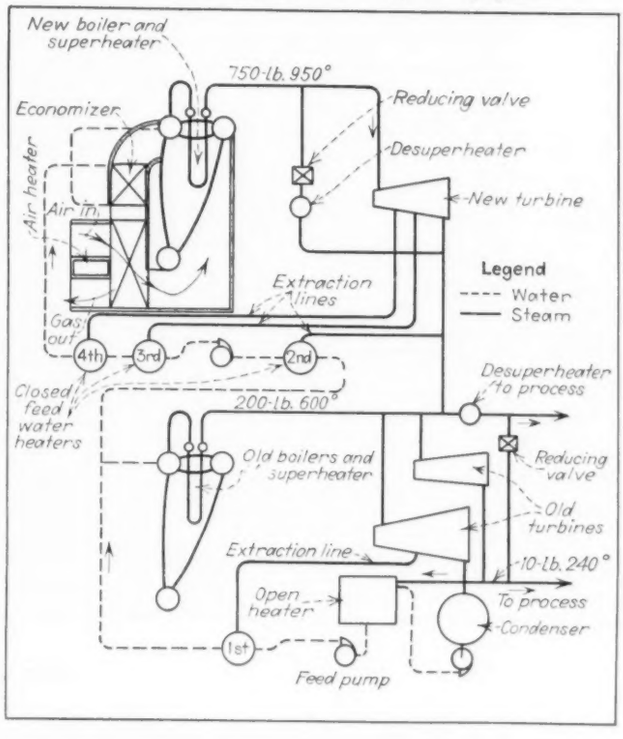
Under this new set-up, with the same amount of steam as formerly (120,000 lb. per hour), the power output will be increased from 5,000 to 7,500 kw., the high-pressure process steam from 15,000 to 22,500 lb. per hour, and the low-pressure process steam from 65,000 to 97,500 lb. per hour. In other words, both the power and the process load will be increased 50% without any increase in the total amount of steam generated.

The high-pressure steam will contain more heat than the steam formerly generated, 1,490 as against 1,320 B.t.u., or 13% more heat; but since the new boilers will be at least 13% more efficient than the old boilers, the unit fuel cost will be reduced at even a greater rate than the increase in capacity. Since the annual fuel bill of a plant of this size is about $150,000, the saving will be more than $75,000 per year.

In the above plant, if there is no need for increase in capacity, superposition can be used to decrease the cost of fuel. Under this arrangement will be superposed a boiler generating 80,000 lb. of steam per hour and a 2,500-kw. turbine. Operation of the condensing machine will be discontinued and the same power and process steam load will be maintained with 33% less steam. Annual savings will be $50,000. If any exhaust steam was formerly wasted, the savings will be greater.

The accompanying sketch shows the power plant under discussion with new high-pressure boiler and turbine superposed on original equipment.

Power plant with new high-pressure boiler and turbine superposed on original equipment



How conditions in any plant can be analyzed to insure equitable assignment of rayon-twisting

Spindles per Spinner

By H. O. Deuel

Mill owners and workers alike are coming to the realization that an equitable work assignment is of mutual benefit. Formerly skeptical of the value of job analyses and time studies, they now recognize these as a means to increase both profits and wages. In this article the actual results of a study made in a large throwing plant are described by Mr. Deuel, Elmira, N. Y., textile engineer and author of "Fundamentals of Industrial Engineering as Applied to Silk and Rayon Manufacture," a correspondence course.

PRIMARILY, the point of greatest interest and of most concern to the workers in any industry is the pay check. Whether that pay check represents weekly wages or quarterly dividends is simply a question of the position held by the individual. However, regardless of the status of the individual, it should be perfectly obvious that the success of the individual depends upon the success of the company from which he receives his pay check. And yet workers too often resist any effort on the part of the management to increase efficiency and decrease operating costs; they ask for higher earnings, with no means of determining the extent to which earnings could be increased. Managements, on the other hand, ask greater production through greater individual effort, with no means of determining just what is fair and equitable.

Every job consists of a number of basic movements, each of which can be performed without undue fatigue by a "normal" operator in a standard time. Each job has its own unit of production, and whether that unit of production consists of one bobbin, one quill, one yard of cloth, or one slashed yard of warp, the separate and distinct movements required to complete that unit of production can be timed and analyzed, and, through analysis, an equitable amount of work or machine units allocated to the individual. Managements must realize that over-load is fully as contributory to inflated costs as is underload. Operators must realize that underload is a disadvantage to themselves, while an equitable assignment of work or machine units can be of benefit.

The various steps in a time-study analysis designed to arrive at equitable allocation of machine units per operator in spinning or twisting 150-denier rayon are discussed below. The spinners were tending 5½ double-deck machines, or 1,100 spindles each. The spinners were cleaning their own boards and bobbins at a table in the center of the department. While the table was in easy view of the foreman, it was not uncommon to find five or six operators at the table discussing grievances, gossiping, and so forth. The operators were well paid considering the production; yet discontent was evident and production was sub-standard in quality and amount.

A preliminary analysis indicated considerable under-load per operator and, inasmuch as spinning costs were high, a revision of spindle assignment appeared to be the major factor. Morale was fair, but the management was apprehensive of the effect of an increase in spindle assignment. A study of 72 consecutive hours was necessary to convince the management that a considerable increase in the number of spindles per operator was not only possible, but perfectly fair and to the advantage of all concerned.

Normal Operator Observed

It was consequently arranged to take a final observation of the performance of a "normal" operator chosen jointly by the engineer and the spinning foreman. The Observation Sheet is shown in Fig. 1. The figures on the lines are the actual watch readings and run from the top down. The figures directly above each watch reading represent the elapsed times or the times required for each movement. Figures in the last column to the right are times allowed.

In analyzing the first movement, it will be noted that four times in nine cycles, the operator completed the movement in 0.04 min. To have allowed 0.05

FIG.1 OBSERVATION SHEET

Department SPINNING Date

Mach. Name and No. FLETCHER Material 150-Den "A" Rayon

Description of Operation 48-50 Turns. Spl. speed 10,250. Winder bob. 24 hr

ELEMENTS	WATCH READINGS										
Swing spindle arm forward, remove bob. and flyer	0.05 0.05	0.06 0.39	0.04 0.70	0.05 1.02	0.04 1.31	0.04 1.58	0.06 1.90	0.04 2.19	0.05 2.53		0.06
Clean flyer	0.02 0.07	0.03 0.42	0.04 0.74	0.03 1.05	0.05 1.36	0.03 1.61	0.04 1.94	0.06 2.25	0.02 2.55		0.04
Pick up full bob. and place on spindle, place flyer on spindle	0.07 0.14	0.06 0.48	0.05 0.79	0.07 1.12	0.05 1.41	0.04 1.65	0.05 1.99	0.04 2.29	0.05 2.60		0.06
Find end, run end through flyer, and allow spindle arm to spring into position against belt	0.12 0.26	0.12 0.60	0.13 0.92	0.09 1.21	0.08 1.49	0.13 1.78	0.12 2.11	0.11 2.40	0.12 2.72		0.13
Pick up steam bob., secure end, and replace bob. in position	0.07 0.33	0.06 0.66	0.05 0.97	0.06 1.27	0.05 1.54	0.06 1.84	0.04 2.15	0.08 2.48	0.06 2.78		0.07
Steaming bob. runs 14 hr.											
Repair break 1 time	5 bob. 0.18	0.21	4 bob. 0.30	0.16	0.15	4 bob. 0.20	0.19	0.18	6 bob.		0.20
Walk to pile for bd. of 30 bob.		2 bd. 1.10			1 bd. 0.96			1 bd. 0.90			1.20

On the observation sheet are shown the actual watch readings and the elapsed time required for each movement of the operation

min. for the movement would have been perfectly fair, inasmuch as it was clearly demonstrated that a normal operator could perform the movement in 0.04 min., and, while the addition of 0.01 min. to the actual time required seems a small factor, it nevertheless is an addition of 25%. Hence, when the engineer allowed 0.06 min., or 50% more time than the actual requirement of a normal operator, the management, the foreman, and the operator agreed that there was no possibility of an injustice to anyone.

Figures Summarized

The figures were then summarized on the Analysis Sheet as shown in Fig. 2. Inasmuch as the steaming bobbin is the unit of production, the time allowed for each movement or element was apportioned to the steaming bobbin. It will be noted that while the actual breaks occurred but 1 time 5 bobbins, 1 time 4, 1 time 4, and 1 time 6 bobbins, time for repairing a break was allowed 1 time 1½ bobbins.

The total work time allowed per steaming bobbin was 0.3681 min. The total filling or running time was 14 hr. or 840 minutes; 840 min. plus 0.3681 min. work time equals 840.3681 min., the total time to produce one steaming bobbin per spindle. The total time for one bobbin divided by the work time for one bobbin will equal the number of bobbins or spindles that can be tended. Hence, 840.3681 min. divided by 0.3681 equals 2,283, the number of spindles that could be tended by one operator, provided all could be loaded and unloaded from one position. However, as it is necessary for the operator to move from spindle to spindle, an allowance for walking and inspection must be made. If it is shown that an operator can tend 2,283 spindles and is asked to tend but 1,900, the time that would be spent in tending the difference, or 383 spindles, can be spent in inspection and walking; 383 equals 20% of 1,900; therefore, if the operator can tend 20% more spindles than he is asked to tend, his walking allowance is 20%.

The spinner chosen for the test was called into conference and the study explained to him in detail. It was pointed out that upon the success of the test depended increased earnings for all the spinners and a saving in operating costs for the company, and that this in turn meant more successful competition with other mills and more stable employment for the workers. A three-day test was made, with the result that the spinner, himself, was convinced that 1,900 spindles was not an overload and that it actually required more effort to kill time than it did to employ the time productively—especially when the effort evolved to his own advantage. The results were that the spinners were given a flat 20% increase in base-rate; doffing weight was increased 14.9%; morale was raised very appreciably; and the company realized a saving in direct labor of approximately 30%.

Obviously, conditions in another plant might call for an entirely different work assignment.

FIG. 3 CALCULATION SHEET

Department SPINNING Date

Mach. Name and No. FLETCHER Material 150-Den "A" Rayon

Description of Operation 48-50 Turns. Spl. speed 10,250. Winder bob. 24 hr

MACHINE CHANGE	TIME PER CHANGE	TIME ALLOWED PER DAY

MACHINE CHANGE ALLOWANCE = MIN.

PERSONAL TIME ALLOWANCE = 20.00

MINUTES PER DAY 480.00 − 20.00 MIN. = 460.00 ACTUAL WORKING MIN.

460.00 A.W.M. / 840.3681 TOTAL ANALYSIS TIME = 0.5473 TOTAL STEAM BOB. PER DAY 1 SPL.

840.3681 T.A.T. / LOAD +UNLOAD 0.3681 +OTHER WORK = 2283.0 NO. OF SPINDLES CAN BE RUN / 1900.0 NO. OF SPLS. ASKED

(Difference = 20% walking time)

480.00 MIN. PER DAY / NO. OF SPLS. ASKED 1900 X 0.5473 P.R.D. PER SPL. = 0.4615 T.A. PER STEAM BOB. 1900 SPLS.

60 MIN. / 0.4615 T.A.P. STEAM BOB. 1900 SPLS. = 130 STEAM BOB. PROD. PER HOUR 1900 SPLS.

(?) BASE RATE / 130 STEAM BOB. P. PER HR = PIECE RATE / OLD RATE

REMARKS: Doffing weight of bobbins increased from 0.155 lb net to 0.177 lb after changeover = 14.9% increase

The calculation sheet is employed for determining the number of spindles which an operator can tend and to find the new piece rate

FIG. 2 ANALYSIS SHEET

Department SPINNING Date

Mach. Name and No. FLETCHER Material 150-Den "A" Rayon

Description of Operation 48-50 Turns. Spl. speed 10,250. Winder bob. 24 hr

NO.	ELEMENTS	TOTAL TIME	TIME PER UNIT
1	Swing spindle arm forward, remove bob. and flyer 1 time 1.7 steam bob. (actual 0.04)	0.06	0.03333
2	Clean flyer 1 time 1.7 steam bob. (actual 0.02)	0.04	0.02222
3	Pick up full bob., place on spindle, and place flyer on spindle (actual 0.04)	0.06	0.03333
4	Find end, run end through flyer, and allow spindle arm to spring into position against belt 1 time 1.7 steam bob. (actual 0.11)	0.13	0.07222
5	Pick up steam bob., secure end, and replace bob. in position 1 time 1.7 steam bob. (actual 0.05)	0.07	0.03888
6	Fill steam bob. – 14 hr.	840.00	840.000
	ADDITIONAL TIME ALLOWED		
1	Repair break 1 time ½ steam bob.	0.20	0.133
2	Go to pile for board of 30 bob. 1 time 51 steam bob.	1.20	0.0235
	Actual Totals Time for 1 steam bob.		840.3681 min
	Time Allowed		
	Time Paid		
	Production Per Hour		

The analysis sheet shows the total time allowed for each movement and the time per unit of production

The Personal Page

William H. Roebken has been elected president of Badger Worsted Mills, Grafton, Wis., succeeding his brother, the late A. W. Roebken. Other changes are: **E. T. Roebken** succeeds **W. H. Roebken** as vice-president and treasurer, while **Wm. A. Roebken** succeeds **E. T. Roebken** as secretary.

Takehiko Uyeda, formerly in charge of cocoon marketing department of the Japanese Ministry of Forestry and Agriculture, has assumed his duties as director of the Japanese Government Raw Silk Intelligence Bureau, with offices in New York, N. Y.

E. C. Geier was elected president of Duplan Silk Corp., at a meeting of the firm's board of directors, Sept. 14; he succeeds **Paul C. Debry** who becomes chairman of the board. Mr. Geier joined the firm in 1909 and became a vice-president in 1927. It was stated that Mr. Debry would continue active as senior executive.

James Chapman, president of Inman (S. C.) Mills and Riverdale Mills, Enoree, S. C. announced the following executive changes: **N. G. Hardie,** superintendent of the Inman plant resigned to become assistant general superintendent of Gossett Mills, Anderson, S. C., and is succeeded by **C. L. Jolly** who was superintendent at Riverdale. **Lee Ramey,** night superintendent at Riverdale, succeeds Mr. Jolly.

Harold C. Barney, formerly with the U. S. Finishing Co., both at Providence R. I., and at Sterling, Conn., has become associated with the sales department of the American Dyeing Association of Rockville, Conn., with headquarters at New York.

Nathaniel Stevens, president of M. T. Stevens & Sons Co., of North Andover, Mass., and elsewhere, on Sept. 11 celebrated his 80th birthday at his home in North Andover, Mass. At his request the company made no special observance of the day. Mr. Stevens' firm was founded in October, 1813, by his grandfather, Capt. Nathaniel Stevens.

Frank H. Naylor, formerly agent for Bibb Mfg. Co., Columbus, Ga. has become vice-president of Jordan Mills, Inc., which firm is successor to the Perkins Hosiery Mills, Columbus, Ga.

Cash Stanley, Jr., associated with the Sylacauga, Ala., plant of the Avondale Mills, has resigned to become assistant professor of textile engineering at the Texas Technological Institute, Lubbock, Tex.

George Whigham, chairman of the board of the Celanese Corp. of America, New York, N. Y., arrived Sept. 14 from Europe on a business trip to the firm's American offices.

Frank W. Jeffers has resigned as vice-president of Southeastern Cottons, Inc., to join the gray goods department of Joshua L. Baily & Co., New York, N. Y. He has been succeeded at Southeastern by **Marvin R. Cross,** who has handled identical lines for various firms including Pilgrim Mills, Fall River, Mass., and Queen City Cotton Mills, Burlington, Vt.

Alex. Engblom, director and technical manager of Boras Wafveri Aktiebolag, Boras, Sweden, one of the largest textile manufacturing companies in that country, is in the United States for a stay of some weeks. Accompanied by two associates, he is studying the advancement of textile manufacture here.

Joseph Sanders last month completed 35 years continuous service with the New York sales office of the Algonquin Printing Co., Fall River, Mass.

A. A. Baumann, oldest employee of the Jantzen Knitting Mills, Portland, Ore., from point of active service, has retired and started, with Mrs. Baumann, on a world cruise.

A. H. C. Brown, president of James Talcott, Inc., Boston, has been elected vice-president of James Talcott, Inc., New York, textile and general factors.

J. M. Rose has resigned as sales manager of the Hockanum women's wear division, J. P. Stevens & Co., New York.

Albert H. Crossman, secretary and vice-president Utica & Mohawk Cotton Mills, Inc., and Utica Willowvale Bleaching Co., Utica, N. Y. has been elected president, succeeding John A. McGregor, who died Sept. 17. **John F. Maynard, Jr.,** has been elected chairman of the board of both companies. **Chas. Millar,** a director and **Chas. F. Fingerhut,** treasurer were elected vice-presidents and **C. Wesley Frame** was elected secretary.

Robert R. Ray, Gastonia, N. C., has just celebrated his 85th birthday and at the same time his 53rd year as treasurer and general manager of the McAden Mills, McAdenville, N. C.

Textile Calendar

- National Association of Hosiery Manufacturers, fall convention, New York, Oct. 14 and 15, 1937.
- Cotton-Textile Institute, Annual Meeting, New York, Oct. 27, 1937.
- U. S. Institute for Textile Research, Inc., Annual meeting, Hotel Commodore, New York, Nov. 4, 1937.
- North Carolina Cotton Manufacturers Association, Annual convention, Carolina Hotel, Pinehurst, N. C., Nov. 4 and 5, 1937.
- Fashion Group, Inc., "Fashion Futures—American Edition," Waldorf-Astoria Hotel, New York, N. Y., Nov. 10, 1937.
- Sixteenth Exposition of Chemical Industries, Grand Central Palace, New York, Dec. 6 to 11, 1937.
- American Association of Textile Chemists and Colorists, annual meeting, Bellevue-Stratford Hotel, Philadelphia, Dec. 3 and 4, 1937.
- Fifth International Heating and Ventilating Exposition, Grand Central Palace, New York, Jan. 24 to 28, 1938.

N. Y. RAYON SALESMEN HOLD FIRST OUTING

The first social gathering of the recently formed Denier Club, composed solely of New York sales representatives of the various rayon yarn companies was held Sept. 17, when a representative group gathered at Huntington, L. I., N. Y., for an outing. Events included golf, tennis, horse-shoe pitching, etc. Winners of the chief sports contests were: tennis—John A. Spooner, *of The American Viscose Corp.; golf*—Ray Daly, *of Celanese Corp. of America, president of the club; horse shoe pitching—prizes were won by the following teams:* Ray Daly *and* Al Tector, R. Swallow *and* J. G. Boston, Dana Gillingham *and* Johnny Holmes, *and* A. G. Siegel *and* J. Hallaren. *Officers of the Denier Club are:* Ray Daly, *president;* J. H. Hammes, *American Viscose Corp., vice-president;* Jerome Lewy, *secretary and treasurer.*

Charles H. Dimick has been appointed general manager of the Textile Dyeing & Printing Co., with plants at Paterson, N. J., and Richmond, Va., succeeding **William Alexander** and **Norman Castle,** formerly general manager and sales manager, respectively. Mr. Dimick will fill both of these positions.

Frank E. Learned has been appointed superintendent at Dartmouth Woolen Mills, Claremont, N. H.

George E. Spofford, treasurer and general manager of the York Mfg. Co., Saco, Me.; the Androscoggin, Bates and Hill Mills, of Lewiston, Me., and the Edwards Mill, of Augusta, Me., was guest of honor at a dinner in Lewiston, Me., recently. Textile associates feted him on his completion of half a century in the industry. He was presented with a watch and chain.

Geo. C. Ramey has been appointed to the newly created post of promotional sales supervisor at Marshall Field & Co., manufacturing division, New York, it is announced. He was formerly sales manager of the hosiery, underwear and lingerie divisions.

William Stewart, treasurer of Southeastern Cottons, Inc., New York, has been elected executive vice-president and will hold both posts.

George R. Grice has resigned as superintendent of the Excell Mfg. Co. Inc., Lincolnton, N. C., and has become superintendent of the Lola Mills, Inc., Stanley, N. C.

John C. Larkin, for many years director of sales for Realart Silk Hoisery Mills, Philadelphia, Pa., has joined the Neva-Wet Corp., New York, and will contact hosiery manufacturers to demonstrate the firm's method of processing as applied to their product.

H. C. Folcke, of Albert H. Vandam Co., New York, was elected president of the Downtown Textile Credit Group, New York, recently; others elected were **A. J. Pischel,** of Joshua L. Baily & Co., vice-president; **W. A. Parker,** of Southeastern Cottons, Inc., second vice-presi-

dent; Edward J. Nugent, of Wamsutta Mills, Inc. treasurer, and **Theodore Keenan,** of Wm. Liddell & Co., secretary.

Dr. Heinz Speier, has recently become connected with the Howard-Arthur Mills, Fall River, Mass., where he is occupied with efficiency work and special engineering problems in the slashing and weaving departments.

W. T. Jeffries has assumed his new duties as superintendent of the Winona (Miss.) Cotton Mill.

J. A. White has become general manager of the Slater (S. C.) Mfg. Co. He formerly held the position of superintendent of Cleveland Cloth Mills, Shelby, N. C.

Peter Lehne, for many years with the United Piece Dye Works Paterson, N. J., and National Weaving Co. Central Falls, R. I. has joined Scheuer & Co. in the rayon gray goods department in New York. He will call on the uptown converting trade.

P. Warren, of Covington, Va., has assumed duties as superintendent, Cascade Rayon Mills, Mooresville, N. C.

Thomas W. Lawton, manager, testing laboratory and the spun rayon development department, Farr Alpaca Co., Holyoke, Mass., has resigned to become superintendent, Monument Mills, Housatonic, Mass.

A Silk Triumvirate at the speakers' table of the Fashion and Silk Dress Forum held by International Silk Guild at Waldorf-Astoria, New York, Sept. 13. (See page 74.) Left to right: Paolino Gerli, of E. Gerli & Co., and president of the Guild; Marcel Rochas, Parisian couturier; F. Ducharne, president of F. Ducharne Silk Co.

C. C. Dawson has become vice-president and a member of the board of directors of the Cramerton (N. C.) Mills, succeeding the late C. D. Welch.

M. P. Fox has been appointed instructor in textile engineering and **Alex C. Taylor,** director of engineering in charge of co-operative courses in chemical, industrial, mechanical and textile engineering at the Alabama Polytechnic Institute at Auburn, Ala., it is announced.

Paul A. Barker has been appointed as assistant to **S. Scott Stewart,** sales manager of Clifton Yarn Mills, Clifton Heights, Pa., with offices in New York, Brooklyn, Providence, Cleveland, Amsterdam, N. Y., etc.

Obituary

Charles A. Rice, an active figure in the textile finishing industry for 40 years, died Sept. 15 in New York. He was associated at various times with Southridge Printing Co., Clark-Rice Corp., his own firm, and New York agent for the Fall River Bleachery.

John A. McGregor, aged 73, president of the Utica & Mohawk Cotton Mills, Inc., Utica, N. Y., died of pneumonia, Sept. 14, at his home in Utica, N. Y.

Francis W. Fabyan, aged 66, former member of Bliss Fabyan & Co., cotton goods, died Sept. 4 at his home on Buttermilk Bay, Buzzards Bay, Mass.

Frederick Swindells, aged 89, Rockville, Conn., owner of the Rock Mfg. Co., there, died Sept. 19 in Boston, Mass. Born in England, he learned weaving in this country.

Arthur R. Marsh, aged 75, a member of the New York Cotton Exchange for nearly 40 years and widely known as an authority on cotton, died Sept. 16 in New York.

Edward T. Pierce, aged 82, president of Pierce Mfg. Co. and the Morse Twist Drill & Machine Co., treasurer of Pierce Bros. and affiliated with many other firms, died Sept. 10 at his home in New Bedford, Mass. A long career in the textile industry included such offices as interim president of American Woolen Co. in 1916, and treasurer of Wamsutta Mills.

Albert Chase Bowman, aged 62, president of the John T. Slack Corp., Springfield, Vt., died Sept. 17. Mr. Bowman was a member of the executive board of the National Association of Wool Manufacturers; president of the Keene (N. H.) Silk Mills; and active in other enterprises.

Lewis E. Taubel, aged 78, owner of the Taubel Hosiery Mill, Norristown, Pa., died Sept. 21 in St. Petersburg, Fla.

Harry Pinkney Barrett, aged 63, departmental superintendent of the Gambrill & Melville Mills Co., Bessemer City, N. C., for 14 years, died Sept. 20.

Edward T. Garsed, aged 73, former southern representative of Crompton & Knowles Loom Works, and well known in the southern textile industry, died recently at Charlotte, N. C.

Harry Hartley, aged 69, for 30 years a wool merchant in Boston and former owner of Victoria Mills, Thornton, R. I., died recently in Lausanne, Switzerland.

David B. Levi, president of Rugby Knitting Mills, Buffalo, N. Y., died recently at his home in that city.

Harry Schwartz, aged 49, founder and president of Classon Knitting Mills, Allentown, Pa., died recently at Long Beach, N. Y. He was buried in Philadelphia.

Joseph Wasserman, aged 76, former president and chairman of the board of Artloom Corp. died Sept. 8 in Boston.

Arthur W. Bradley, aged 70, superintendent of the W. H. Bullard Thread Co. Holyoke, Mass. for the last 35 years, died Sept. 22.

George R. Bowley, aged 69, and for more than 50 years connected with the Sanford Mills, Sanford, Me., including 36 years as weaving overseer at Mill C, died Sept. 2 at Mousam Lake, near Sanford.

John W. Fitzgerald, aged 60, vice-president and credit manager, Wm. Iselin & Co., New York, died Sept. 17, at his home in New York. He spent all his business career with that firm.

Herbert G. Golding, aged 63, secretary, Alexander Smith & Sons Carpet Co., Yonkers, N. Y., died recently at his home there.

Albert P. Foster, aged 81, retired spinning overseer, died in Dixfield, Me., Sept. 5. He was engaged in the woolen manufacturing business for 50 years and travelled extensively for the Davis & Furber Machine Co., North Andover, Mass.

T. N. Crocker, aged 61, formerly superintendent of the Lydia Cotton Mills, Clinton, S. C., and Joanna Cotton Mills at Goldville, S. C., died recently at his home in Enoree, S. C.

R. L. Cloninger, aged 43, overseer, Cannon Mills, Kannapolis, N. C., died in a Richmond, Va., hospital, recently.

Arthur W. Roebken, aged 54, president and general manager of the Badger Worsted Mills of Grafton, Wis., died at his home in Cedarburg, Wis., recently.

John J. Foley, for 20 years an overseer at the Chicopee (Mass.) Mfg. Co. died recently.

Thomas Flynn, general superintendent, Berkshire Fine Spinning Associates, Pawtucket, R. I., died Sept. 27, at his home there. Formerly he was for 20 years superintendent, cotton department, Royal Weaving Co., Pawtucket.

Thomas Allsop, aged 71, president of the Philadelphia Drying Machine Co., died Sept. 24 at his home in Mt. Airy, Pa.

Textile Personalities

T. M. Marchant

GENIAL Thomas M. Marchant, president of Victor-Monaghan Co., Greenville, S. C., might have been a second Babe Ruth if he hadn't broken a finger during a fast game of baseball early in life. With definite professional baseball possibilities, this accident precipitated him, while convalescing, into a combination job as office boy and supply clerk at Victor Mill, near Greer, S. C., which had been built on land formerly belonging to his father. Victor Mill was headed up at the time by the late Lewis W. Parker who immediately recognized young Tom's ability and sent him to Greenville where he was put in charge of supplies and purchasing for six or eight mills in the Parker group. By 1912, he was in charge of manufacturing of the sixteen mills operated by Parker Cotton Mills Co., and a few years later succeeded the late W. E. Beattie as president of what is now Victor-Monaghan Co. Mr. Marchant was only 42 years old at the time.

For several years, he devoted his efforts toward building Victor-Monaghan into one of the most important print-cloth groups in the South. Then, in 1933, the southern mill men asked him to take the helm as president of the American Cotton Manufacturers Association. Throughout that hectic year, as NRA came into being, Mr. Marchant, at the expense of his private interests, gave unstintingly of his time in an effort to help coordinate a torn-up industry's policies. When he turned the reins over to his successor, the outlook of the industry had been completely revolutionized, and there is no doubt that he, and other forward-looking manufacturers, played a definite part in bringing about many of the basic improvements apparent ever since.

One of Mr. Marchant's pet hobbies, not forgetting an early love for baseball, is a modest cottage at Caesar's Head, in the Blue Ridge mountains, where he spends as much time as possible with his family.

AS golfer he plays a good average game. As fisherman (believe it or not) he recently hooked a 60-lb tuna off Montauk Point. In case these two points do not immediately identify Douglas Walker, let us add that he is president of Douglas Walker & Co., raw silk dealers, and for the last decade or so a leading figure in most trade-wide activities of that textile branch.

Best known probably for his pioneer work in helping to organize the National Raw Silk Exchange, New York, and its successor, the silk division of the Commodity Exchange, "Doug" Walker still has found time to build up his own successful silk trading organization, and also to indulge a flair for journalism. As preliminary to 19 years in the raw silk field, Mr. Walker started his career in 1909 in the advertising service department of the Hill Publishing Co., which later was merged into the McGraw-Hill Publishing Co. After that, he was associated for several years with the Silk Publishing Co.; then he operated briefly as an independent silk broker, and from 1922 to 1928, held sales posts in the raw silk division of Japan Cotton Trading Co. As result of an industry-wide movement led by Paolino Gerli, Mr. Walker, and others, the National Raw Silk Exchange was formed in 1928, and Mr. Walker became chief of the Exchange's Intelligence Bureau, continuing there until he formed his own company in 1931.

Douglas Walker

Among various other trade affiliations, Mr. Walker is vice-president and founder-member of the Commodity Exchange, and board member and founder-member of the International Silk Guild.

For the rest, he is married, commutes to his New York office from Glen Rock, N. J., is a member of the board of the North Jersey Country Club—and, as noted, is an outdoor enthusiast with a predeliction for "garden loafing."

William R. Odell

HOW many men on their 82d birthdays round out also 60 years of active business? Such was the distinctive achievement this year of William R. Odell, president of Kerr Bleaching & Finishing Works, Inc., Concord, N. C. Being the son of J. M. Odell, first president of Cannon Mills, William R. was brought to an early association with the textile industry. Through the more than three-quarters of a century that has elapsed, he has maintained a progressive viewpoint which lists him right now among the "moderns" in the southern textile field. We would call him a modern pioneer, for pioneer in southern textiles he undoubtedly is. "One weaver ran two to four looms in those days," said Mr. Odell, speaking of the times, back in '77 when he, a youngster just out of college, and his father organized Concord's first mill. Duke University recently recognized him as their oldest living graduate and hung his portrait on the wall of the college library. But his main interest is the "Works," There he will generally be found, in an office that might well be the pride of any man in the industry. Glass brick, resilient floors, accoustically treated ceilings, comfortable and efficient furnishings, all denote this modern pioneer.

SHRINKAGE TABLES

For quick determination of 1/2 to 25% shrinkage covering pieces ranging from 50 to 100 yards

By John A. Stewart

COMPILED FOR USE BY WEAVERS, DYERS, FINISHERS, AND CONVERTERS

Copies of these tables will be available in reprint form at 25c per copy
Address TEXTILE WORLD, 330 West 42nd Street, N. Y.

SHRINKAGE TABLES

For quick determination of ½% to 25% shrinkage, covering pieces ranging from 50 to 100 yards

From weavers, dyers, finishers, and converters,* TEXTILE WORLD *has received frequent requests for tables showing shrinkages up to 25% on pieces up to 100 yd. long. The nearest thing to these which we were able to find was a booklet, copyrighted in 1928 by John A. Stewart, which gave shrinkages from 2½ to 15% on pieces ranging from 50 to 80 yd. As a service to our readers, we induced Mr. Stewart to revise and amplify the data in that booklet to meet present-day requirements. The result is the following series of ready-reference tables covering pieces from 50 to 100 yd. in length and shrinkages from ½% to 25%.

By JOHN A. STEWART

THESE TABLES permit the quick determination of per cent of shrinkage and eliminate the need for any calculations on pieces ranging from 50 to 100 yd. in length. The original length of the piece in whole yards and additional eighths of a yard is given in the left-hand column of each table. Finished lengths of the piece are given on the same line in the columns to the right. Per cents of shrinkage are given at the top of each section of the tables. For convenience in reading, each table is divided into three sections—top section gives ½ to 8% shrinkage; middle section, 8½% to 16½% shrinkage; bottom section, 17 to 25% shrinkage. Note that fractional eighths are given in whole numbers following the yardage figure, thus 56-4 stands for 56 4/8 yd.

To determine per cent of shrinkage when original length and finished length are known, find original length of piece in left-hand column, follow to right along same line to finished length, read per cent of shrinkage at top of column in which finished length appears.

EXAMPLE: *Original length 50⅞ yd. (in table for brevity, 50-7); finished length 46 4/8 yd. (46-4); shrinkage 8½%.*

To find finished length needed when original length and required per cent shrinkage are known, follow down column in which per cent of shrinkage appears to same line with original length.

EXAMPLE: *Original length 51⅜ yd. (51-3); shrinkage required 24%; finished length needed 39 yd. (39-0).*

Shrinkage of pieces ranging from 101 to 200 yd. can be found by considering only half of the piece and applying the method described above to these figures. Thus, merely divide both original length and finished length (measured to nearest ¼ yd.) by two, and find per cent shrinkage in the usual way.

EXAMPLE: *Original length 120 yd.; finished length 102 yd. Dividing by two, one gets: original length, 60 yd.; finished length, 51 yd. Using 60-yd. table one finds the shrinkage to be 15%.*

Finished length of pieces ranging from 102 to 200 yd. can be determined to nearest ¼ yd. by dividing original length of piece by two and multiplying by two the finished length as found in table.

EXAMPLE: *Original length, 120 4/8 yd.; shrinkage required 3%. Dividing by two, one gets original length 60 2/8 yd. According to the 60-yd. table, finished length is 58-4 (58 4/8 yd.). Multiplying by two, one gets 117 yd. as finished length of the 120 4/8-yd. piece.*

50 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
50-0	49-6	49-4	49-2	49-0	48-6	48-4	48-2	48-0	47-6	47-4	47-2	47-0	46-6	46-4	46-2	46-0
50-1	49-7	49-5	49-3	49-1	48-7	48-5	48-3	48-1	47-7	47-5	47-3	47-1	46-7	46-5	46-3	46-1
50-2	50-0	49-6	49-4	49-2	49-0	48-6	48-4	48-2	48-0	47-6	47-4	47-2	47-0	46-6	46-4	46-2
50-3	50-1	49-7	49-5	49-3	49-1	48-7	48-5	48-3	48-1	47-7	47-5	47-3	47-1	46-7	46-5	46-3
50-4	50-2	50-0	49-6	49-4	49-2	49-0	48-6	48-4	48-2	48-0	47-6	47-4	47-2	47-0	46-6	46-4
50-5	50-3	50-1	49-7	49-5	49-3	49-1	48-7	48-5	48-3	48-1	47-7	47-5	47-3	47-1	46-7	46-5
50-6	50-4	50-2	50-0	49-6	49-4	49-2	49-0	48-6	48-4	48-2	48-0	47-6	47-4	47-2	47-0	46-6
50-7	50-5	50-3	50-1	49-7	49-5	49-3	49-1	48-7	48-5	48-3	48-1	47-7	47-5	47-3	47-0	46-6

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
50-0	45-6	45-4	45-2	45-0	44-6	44-4	44-2	44-0	43-6	43-4	43-2	43-0	42-6	42-4	42-2	42-0	41-6
50-1	45-7	45-5	45-3	45-1	44-7	44-5	44-3	44-1	43-7	43-5	43-3	43-1	42-7	42-5	42-3	42-1	41-7
50-2	46-0	45-6	45-4	45-2	45-0	44-6	44-4	44-2	44-0	43-6	43-4	43-2	43-0	42-6	42-4	42-2	42-0
50-3	46-1	45-7	45-5	45-3	45-1	44-7	44-5	44-3	44-1	43-7	43-5	43-3	43-1	42-7	42-5	42-3	42-1
50-4	46-2	46-0	45-6	45-4	45-2	45-0	44-6	44-4	44-2	44-0	43-6	43-4	43-2	43-0	42-5	42-3	42-1
50-5	46-3	46-1	45-7	45-4	45-2	45-0	44-6	44-4	44-2	44-0	43-6	43-4	43-2	43-0	42-6	42-4	42-2
50-6	46-3	46-1	45-7	45-5	45-3	45-1	44-7	44-5	44-3	44-1	43-7	43-5	43-3	43-1	42-7	42-5	42-3
50-7	46-4	46-2	46-0	45-6	45-4	45-2	45-0	44-6	44-4	44-2	44-0	43-6	43-4	43-2	43-0	42-6	42-4

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
50-0	41-4	41-2	41-0	40-6	40-4	40-2	40-0	39-6	39-4	39-2	39-0	38-6	38-4	38-2	38-0	37-6	37-4
50-1	41-5	41-3	41-1	40-7	40-5	40-3	40-1	39-7	39-5	39-3	39-1	38-7	38-5	38-3	38-1	37-7	37-5
50-2	41-6	41-4	41-2	41-0	40-6	40-4	40-2	40-0	39-6	39-4	39-2	39-0	38-6	38-4	38-2	38-0	37-6
50-3	41-6	41-4	14-2	41-0	40-6	40-4	40-2	40-0	39-6	39-4	39-2	39-0	38-6	38-4	38-2	38-0	37-6
50-4	41-7	41-5	41-3	41-1	40-7	40-5	40-3	40-1	39-7	39-5	39-3	39-1	38-7	38-5	38-3	38-1	37-7
50-5	42-0	41-6	41-4	41-2	41-0	40-6	40-4	40-2	40-0	39-6	39-4	39-2	39-0	38-6	38-4	38-2	38-0
50-6	42-1	41-7	41-5	41-3	41-1	40-7	40-5	40-3	40-1	39-7	39-5	39-3	39-1	38-7	38-5	38-3	38-1
50-7	42-2	42-0	41-6	41-4	41-2	41-0	40-6	40-4	40-2	39-7	39-5	39-3	39-1	38-7	38-5	38-3	38-1

51 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
51-0	50-6	50-4	50-2	50-0	49-6	49-4	49-2	49-0	48-6	48-4	48-2	48-0	47-6	47-4	47-2	47-0
51-1	50-7	50-5	50-3	50-1	49-7	49-5	49-3	49-1	48-7	48-5	48-3	48-1	47-7	47-5	47-3	47-1
51-2	51-0	50-6	50-4	50-2	50-0	49-6	49-4	49-2	49-0	48-6	48-4	48-2	48-0	47-6	47-4	47-2
51-3	51-1	50-7	50-5	50-3	50-1	49-7	49-5	49-3	49-1	48-7	48-5	48-3	48-1	47-7	47-5	47-3
51-4	51-2	51-0	50-6	50-4	50-2	50-0	49-6	49-4	49-2	48-7	48-5	48-4	48-2	48-0	47-6	47-4
51-5	51-3	51-1	50-7	50-5	50-3	50-1	49-7	49-5	49-3	49-0	48-6	48-4	48-2	48-0	47-7	47-5
51-6	51-4	51-2	51-0	50-6	50-4	50-2	50-0	49-6	49-4	49-1	48-7	48-5	48-3	48-1	47-7	47-5
51-7	51-5	51-3	51-1	50-7	50-5	50-3	50-1	49-6	49-4	49-2	49-0	48-6	48-4	48-2	48-0	47-6

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
51-0	46-5	46-3	46-1	45-7	45-5	45-3	45-1	44-7	44-5	44-3	44-1	43-7	43-5	43-3	43-1	42-7	42-5
51-1	46-6	46-4	46-2	46-0	45-6	45-4	45-2	45-0	44-6	44-4	44-2	44-0	43-6	43-4	43-2	43-0	42-6
51-2	46-7	46-5	46-3	46-1	45-7	45-5	45-3	45-1	44-7	44-5	44-3	44-1	43-7	43-5	43-2	43-0	42-6
51-3	47-0	46-6	46-4	46-2	46-0	45-6	45-4	45-2	45-0	44-6	44-4	44-1	43-7	43-5	43-3	43-1	42-7
51-4	47-1	46-7	46-5	46-3	46-1	45-7	45-5	45-3	45-1	44-6	44-4	44-2	44-0	43-6	43-4	43-2	43-0
51-5	47-2	47-0	46-6	46-4	46-2	46-0	45-6	45-3	45-1	44-7	44-5	44-3	44-1	43-7	43-5	43-3	43-1
51-6	47-3	47-1	46-7	46-5	46-3	46-1	45-6	45-4	45-2	45-0	44-6	44-4	44-2	44-0	43-6	43-4	43-2
51-7	47-4	47-2	47-0	46-6	46-3	46-1	45-7	45-5	45-3	45-1	44-7	44-5	44-3	44-1	43-7	43-5	43-3

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
51-0	42-3	42-1	41-7	41-5	41-2	41-0	40-6	40-4	40-2	40-0	39-6	39-4	39-2	39-0	38-6	38-4	38-2
51-1	42-3	42-1	41-7	41-5	41-3	41-1	40-7	40-5	40-3	40-1	39-7	39-5	39-3	39-1	38-7	38-5	38-3
51-2	42-4	42-2	42-0	41-6	41-4	41-2	41-0	40-6	40-4	40-2	40-0	39-6	39-4	39-2	39-0	38-6	38-4
51-3	42-5	42-3	42-1	41-7	41-5	41-3	41-1	40-7	40-5	40-3	40-1	39-7	39-4	39-2	39-0	38-6	38-4
51-4	42-6	42-4	42-2	42-0	41-6	41-4	41-2	41-0	40-5	40-3	40-1	39-7	39-5	39-3	39-1	38-7	38-5
51-5	42-7	42-5	42-3	42-1	41-7	41-4	41-2	41-0	40-6	40-4	40-2	40-0	39-6	39-4	39-2	39-0	38-6
51-6	43-0	42-6	42-3	42-1	41-7	41-5	41-3	41-1	40-7	40-5	40-3	40-1	39-7	39-5	39-3	39-1	38-7
51-7	43-0	42-6	42-4	42-2	42-0	41-6	41-4	41-2	41-0	40-6	40-4	40-2	40-0	39-5	39-3	39-1	38-7

52 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
52-0	51-6	51-4	51-2	51-0	50-5	50-3	50-1	49-7	49-5	49-3	49-1	48-7	48-5	48-3	48-1	47-7
52-1	51-7	51-5	51-3	51-1	50-6	50-4	50-2	50-0	49-6	49-4	49-2	49-0	48-6	48-4	48-2	48-0
52-2	52-0	51-6	51-4	51-2	50-7	50-5	50-3	50-1	49-7	49-5	49-3	49-1	48-7	48-5	48-3	48-1
52-3	52-1	51-7	51-5	51-3	51-0	50-6	50-4	50-2	50-0	49-6	49-4	49-2	49-0	48-6	48-4	48-2
52-4	52-2	52-0	51-6	51-4	51-1	50-7	50-5	50-3	50-1	49-7	49-5	49-3	49-1	48-7	48-5	48-2
52-5	52-3	52-1	51-7	51-5	51-2	51-0	50-6	50-4	50-2	50-0	49-6	49-4	49-2	49-0	48-5	48-3
52-6	52-4	52-2	52-0	51-6	51-3	51-0	50-7	50-5	50-3	50-1	49-7	49-5	49-3	49-0	48-6	48-4
52-7	52-5	52-3	52-1	51-7	51-4	51-2	51-0	50-6	50-4	50-2	50-0	49-6	49-4	49-1	48-7	48-5

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
52-0	47-5	47-2	47-0	46-6	46-4	46-2	46-0	45-6	45-4	45-2	45-0	44-6	44-4	44-2	44-0	43-5	43-3
52-1	47-6	47-3	47-1	46-7	46-5	46-3	46-1	45-7	45-5	45-3	45-1	44-7	44-5	44-2	44-0	43-6	43-4
52-2	47-6	47-4	47-2	47-0	46-6	46-4	46-2	46-0	45-6	45-4	45-2	44-7	44-5	44-3	44-1	43-7	43-5
52-3	47-7	47-5	47-3	47-1	46-7	46-5	46-3	46-1	45-7	45-5	45-2	45-0	44-6	44-4	44-2	44-0	43-6
52-4	48-0	47-6	47-4	47-2	47-0	46-6	46-4	46-2	46-0	45-5	45-3	45-1	44-7	44-5	44-3	44-1	43-7
52-5	48-1	47-7	47-5	47-3	47-1	46-7	46-4	46-2	46-0	45-6	45-4	45-2	45-0	44-6	44-4	44-2	44-0
52-6	48-2	48-0	47-6	47-4	47-2	47-0	46-5	46-3	46-1	45-7	45-5	45-3	45-1	44-7	44-5	44-2	44-0
52-7	48-3	48-1	47-7	47-5	47-3	47-0	46-6	46-4	46-2	46-0	45-6	45-4	45-2	45-0	44-5	44-3	44-1

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
52-0	43-1	42-7	42-5	42-3	42-1	41-7	41-5	41-3	41-1	40-7	40-4	40-2	40-0	39-6	39-4	39-2	39-0
52-1	43-2	43-0	42-6	42-4	42-2	42-0	41-6	41-4	41-1	40-7	40-5	40-3	40-1	39-7	39-5	39-3	39-1
52-2	43-3	43-1	42-7	42-5	42-3	42-0	41-6	41-4	41-2	41-0	40-6	40-4	40-2	40-0	39-6	39-4	39-2
52-3	43-4	43-2	43-0	42-5	42-3	42-1	41-7	41-5	41-3	41-1	40-7	40-5	40-3	40-1	39-6	39-4	39-2
52-4	43-5	43-3	43-0	42-6	42-4	42-2	42-0	41-6	41-4	41-2	41-0	40-6	40-3	40-1	39-7	39-5	39-3
52-5	43-5	43-3	43-1	42-7	42-5	42-3	42-1	41-7	41-5	41-2	41-0	40-6	40-4	40-2	40-0	39-6	39-4
52-6	43-6	43-4	43-2	43-0	42-6	42-4	42-2	41-7	41-5	41-3	41-1	40-7	40-5	40-3	40-1	39-7	39-5
52-7	43-7	43-5	43-3	43-1	42-7	42-4	42-2	42-0	41-6	41-4	41-2	41-0	40-6	40-4	40-1	39-7	39-5

53 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
53-0	2-6	52-4	52-2	52-0	51-5	51-3	51-1	50-7	50-5	50-3	50-1	49-7	49-4	49-2	49-0	48-6
53-1	2-7	52-5	52-3	52-1	51-6	51-4	51-2	51-0	50-6	50-4	50-2	50-0	49-5	49-3	49-1	48-7
53-2	3-0	52-6	52-4	52-1	51-7	51-5	51-3	51-1	50-7	50-5	50-3	50-1	49-6	49-4	49-2	49-0
53-3	3-1	52-7	52-5	52-2	52-0	51-6	51-4	51-2	51-0	50-6	50-4	50-2	49-7	49-5	49-3	49-1
53-4	3-2	53-0	52-6	52-3	52-0	51-6	51-4	51-2	51-0	50-6	50-4	50-2	50-0	49-6	49-4	49-2
53-5	3-3	53-1	52-7	52-4	52-1	51-7	51-5	51-3	51-1	50-7	50-5	50-3	50-1	49-7	49-5	49-3
53-6	3-4	53-2	53-0	52-5	52-2	52-0	51-6	51-4	51-2	51-0	50-6	50-4	50-2	50-0	49-6	49-4
53-7	3-5	53-3	53-1	52-6	52-3	52-1	51-7	51-5	51-3	51-1	50-7	50-5	50-3	50-1	49-7	49-5

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
53-0	48-4	48-2	48-0	47-6	47-3	47-1	46-7	46-5	46-3	46-1	45-7	45-5	45-3	45-0	44-6	44-4	44-2
53-1	48-5	48-3	48-1	47-7	47-4	47-2	47-0	46-6	46-4	46-2	46-0	45-5	45-3	45-1	44-7	44-5	44-3
53-2	48-6	48-4	48-2	47-7	47-5	47-3	47-1	46-7	46-5	46-3	46-1	45-6	45-4	45-2	45-0	44-6	44-4
53-3	48-7	48-5	48-3	48-0	47-6	47-4	47-2	47-0	46-6	46-4	46-1	45-7	45-5	45-3	45-1	44-7	44-5
53-4	49-0	48-6	48-3	48-1	47-7	47-5	47-3	47-1	46-7	46-4	46-2	46-0	45-6	45-4	45-2	45-0	44-5
53-5	49-1	48-6	48-4	48-2	48-0	47-6	47-4	47-2	46-7	46-5	46-3	46-1	45-7	45-5	45-3	45-0	44-6
53-6	49-1	48-7	48-5	48-3	48-1	47-7	47-5	47-2	47-0	46-6	46-4	46-2	46-0	45-6	45-3	45-1	44-7
53-7	49-2	49-0	48-6	48-4	48-2	48-0	47-5	47-3	47-1	46-7	46-5	46-3	46-1	45-6	45-4	45-2	45-0

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
53-0	44-0	43-6	43-4	43-2	42-7	42-5	42-3	42-1	41-7	41-5	41-3	41-1	40-6	40-4	40-2	40-0	39-6
53-1	44-1	43-7	43-4	43-2	43-0	42-6	42-4	42-2	42-0	41-6	41-4	41-1	40-7	40-5	40-3	40-1	39-7
53-2	44-2	43-7	43-5	43-3	43-1	42-7	42-5	42-3	42-1	41-6	41-4	41-2	41-0	40-6	40-4	40-2	40-0
53-3	44-2	44-0	43-6	43-4	43-2	43-0	42-6	42-3	42-1	41-7	41-5	41-3	41-1	40-7	40-5	40-2	40-0
53-4	44-3	44-1	43-7	43-5	43-3	43-1	42-6	42-4	42-2	42-0	41-6	41-4	41-2	40-7	40-5	40-3	40-1
53-5	44-4	44-2	44-0	43-6	43-3	43-1	42-7	42-5	42-3	42-1	41-7	41-4	41-2	41-0	40-6	40-4	40-2
53-6	44-5	44-3	44-1	43-6	43-4	43-2	43-0	42-6	42-4	42-2	41-7	41-5	41-3	41-1	40-7	40-5	40-3
53-7	44-6	44-4	44-1	43-7	43-5	43-3	43-1	42-7	42-4	42-2	42-0	41-6	41-4	41-2	41-0	40-5	40-3

54 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
54-0	53-6	53-4	53-2	52-7	52-5	52-3	52-1	51-7	51-5	51-3	51-1	50-6	50-4	50-2	50-0	49-5
54-1	53-7	53-5	53-3	53-0	52-6	52-4	52-2	52-0	51-6	51-4	51-2	50-7	50-5	50-3	50-1	49-6
54-2	54-0	53-6	53-3	53-1	52-7	52-5	52-3	52-1	51-7	51-5	51-3	51-0	50-6	50-4	50-1	49-7
54-3	54-1	53-7	53-4	53-2	53-0	52-6	52-4	52-2	52-0	51-6	51-4	51-1	50-7	50-5	50-2	50-0
54-4	54-2	54-0	53-5	53-3	53-1	52-7	52-5	52-3	52-1	51-7	51-5	51-2	51-0	50-5	50-3	50-1
54-5	54-3	54-1	53-6	53-4	53-2	53-0	52-6	52-4	52-2	52-0	51-6	51-3	51-1	50-6	50-4	50-2
54-6	54-4	54-2	53-7	53-5	53-3	53-1	52-7	52-5	52-3	52-1	51-7	51-4	51-2	50-7	50-5	50-3
54-7	54-5	54-3	54-0	53-6	53-4	53-2	53-0	52-6	52-4	52-2	52-0	51-5	51-2	51-0	50-6	50-4

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
54-0	49-3	49-1	48-7	48-5	48-3	48-0	47-6	47-4	47-2	47-0	46-6	46-4	46-1	45-7	45-5	45-3	45-1
54-1	49-4	49-2	49-0	48-6	48-4	48-1	47-7	47-5	47-3	47-1	46-7	46-4	46-2	46-0	45-6	45-4	45-2
54-2	49-5	49-3	49-1	48-7	48-4	48-2	48-0	47-6	47-4	47-2	46-7	46-5	46-3	46-1	45-7	45-5	45-2
54-3	49-6	49-4	49-2	49-0	48-5	48-3	48-1	47-7	47-5	47-2	47-0	46-6	46-4	46-2	46-0	45-5	45-3
54-4	49-7	49-5	49-3	49-0	48-6	48-4	48-2	48-0	47-6	47-3	47-1	46-7	46-5	46-3	46-0	45-6	45-4
54-5	50-0	49-6	49-3	49-1	48-7	48-5	48-3	48-1	47-6	47-4	47-2	47-0	46-6	46-3	46-1	45-7	45-5
54-6	50-1	49-7	49-4	49-2	49-0	48-6	48-4	48-1	47-7	47-5	47-3	47-1	46-6	46-4	46-2	46-0	45-6
54-7	50-2	49-7	49-5	49-3	49-1	48-7	48-5	48-2	48-0	47-6	47-4	47-2	46-7	46-5	46-3	46-1	45-7

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
54-0	44-7	44-4	44-2	44-0	43-6	43-4	43-2	42-7	42-5	42-3	42-1	41-7	41-5	41-2	41-0	40-6	40-4
54-1	44-7	44-5	44-3	44-1	43-7	43-5	42-2	43-0	42-6	42-4	42-2	42-0	41-5	41-3	41-1	40-7	40-5
54-2	45-0	44-6	44-4	44-2	44-0	43-5	43-3	43-1	42-7	42-5	42-3	42-0	41-6	41-4	41-2	41-0	40-6
54-3	45-1	44-7	44-5	44-3	44-0	43-6	43-4	43-2	43-0	42-5	42-3	42-1	41-7	41-5	41-3	41-0	40-6
54-4	45-2	45-0	44-6	44-3	44-1	43-7	43-5	43-3	43-0	42-6	42-4	42-2	42-0	41-6	41-3	41-1	40-7
54-5	45-3	45-1	44-6	44-4	44-2	44-0	43-6	43-3	43-1	42-7	42-5	42-3	42-0	41-6	41-4	41-2	41-0
54-6	45-4	45-1	44-7	44-5	44-3	44-1	43-6	43-4	43-2	43-0	42-6	42-3	42-1	41-7	41-5	41-3	41-1
54-7	45-4	45-2	45-0	44-6	44-4	44-1	43-7	43-5	43-3	43-1	42-6	42-4	42-2	42-0	41-6	41-3	41-1

55 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
55-0	54-6	54-4	54-1	53-7	53-4	53-2	53-0	52-6	52-4	52-2	52-0	51-6	51-3	51-1	50-7	50-5
55-1	54-7	54-5	54-2	54-0	53-5	53-3	53-1	52-7	52-5	52-3	52-1	51-7	51-4	51-2	51-0	50-6
55-2	55-0	54-6	54-3	54-1	53-6	53-4	53-2	53-0	52-6	52-4	52-2	52-0	51-5	51-3	51-1	50-7
55-3	55-1	54-7	54-4	54-2	53-7	53-5	53-3	53-1	52-7	52-5	52-2	52-0	51-6	51-4	51-2	51-0
55-4	55-2	55-0	54-5	54-3	54-0	53-6	53-4	53-2	53-0	52-6	52-3	52-1	51-7	51-5	51-3	51-0
55-5	55-3	55-1	54-6	54-4	54-1	53-7	53-5	53-3	53-1	52-7	52-4	52-2	52-0	51-6	51-4	51-1
55-6	55-4	55-2	54-7	54-5	54-2	54-0	53-6	53-4	53-2	53-0	52-5	52-3	52-1	51-7	51-5	51-2
55-7	55-5	55-3	55-0	54-6	54-3	54-1	53-7	53-5	53-3	53-1	52-6	52-4	52-2	52-0	51-5	51-3

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
55-0	50-3	50-0	49-6	49-4	49-2	49-0	48-5	48-3	48-1	47-7	47-5	47-2	47-0	46-6	46-4	46-2	45-7
55-1	50-4	50-1	49-7	49-5	49-3	49-0	48-6	48-4	48-2	48-0	47-5	47-3	47-1	46-7	46-5	46-2	46-0
55-2	50-4	50-2	50-0	49-6	49-4	49-1	48-7	48-5	48-3	48-1	47-6	47-4	47-2	47-0	46-5	46-3	46-1
55-3	50-5	50-3	50-1	49-7	49-4	49-2	49-0	48-6	48-4	48-1	47-7	47-5	47-3	47-1	46-6	46-4	46-2
55-4	50-6	50-4	50-2	50-0	49-5	49-3	49-1	48-7	48-4	48-2	48-0	47-6	47-4	47-1	46-7	46-5	46-3
55-5	50-7	50-5	50-3	50-1	49-6	49-4	49-2	49-0	48-5	48-3	48-1	47-7	47-4	47-2	47-0	46-6	46-4
55-6	51-0	50-6	50-4	50-1	49-7	49-5	49-3	49-0	48-6	48-4	48-2	48-0	47-5	47-3	47-1	46-7	46-4
55-7	51-1	50-7	50-5	50-2	50-0	49-6	49-4	49-1	48-7	48-5	48-3	48-0	47-6	47-4	47-2	47-0	46-5

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
55-0	45-5	45-3	45-1	44-7	44-4	44-2	44-0	43-6	43-4	43-1	42-7	42-5	42-3	42-1	41-6	41-4	41-2
55-1	45-6	45-4	45-2	44-7	44-5	44-3	44-1	43-7	43-4	42-2	43-0	42-6	42-4	42-1	41-7	41-5	41-3
55-2	45-7	45-5	45-2	45-0	44-6	44-4	44-2	43-7	43-5	43-3	43-1	42-7	42-4	42-2	42-0	41-6	41-4
55-3	46-0	45-5	45-3	45-1	44-7	44-5	44-2	44-0	43-6	43-4	43-2	42-7	42-5	42-3	42-1	41-6	41-4
55-4	46-1	45-6	45-4	45-2	45-0	44-5	44-3	44-1	43-7	43-5	43-2	43-0	42-6	42-4	42-1	41-7	41-5
55-5	46-1	45-7	45-5	45-3	45-0	44-6	44-4	44-2	44-0	43-5	43-3	43-1	42-7	42-4	42-2	42-0	41-6
55-6	46-2	46-0	45-6	45-3	45-1	44-7	44-5	44-3	44-0	43-6	43-4	43-2	42-7	42-5	42-3	42-1	41-7
55-7	46-3	46-1	45-7	45-4	45-2	45-0	44-6	44-3	44-1	43-7	43-5	43-2	43-0	42-6	42-4	42-1	41-7

56 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
56-0	55-6	55-4	55-1	54-7	54-4	54-2	54-0	53-6	53-4	53-2	53-0	52-5	52-3	52-1	51-6	51-4
56-1	55-7	55-5	55-2	55-0	54-5	54-3	54-1	53-7	53-5	53-3	53-1	52-6	52-4	52-2	51-7	51-5
56-2	56-0	55-6	55-3	55-1	54-6	54-4	54-2	54-0	53-6	53-4	53-2	52-7	52-5	52-3	52-0	51-6
56-3	56-1	55-6	55-4	55-2	54-7	54-5	54-3	54-1	53-7	53-5	53-3	53-0	52-6	52-3	52-1	51-7
56-4	56-2	55-7	55-5	55-3	55-0	54-6	54-4	54-2	54-0	53-6	53-4	53-1	52-7	52-4	52-2	52-0
56-5	56-3	56-0	55-6	55-4	55-1	54-7	54-5	54-3	54-1	53-7	53-5	53-2	53-0	52-5	52-3	52-1
56-6	56-4	56-1	55-7	55-5	55-2	55-0	54-6	54-4	54-2	54-0	53-6	53-3	53-1	52-6	52-4	52-2
56-7	56-5	56-2	56-0	55-6	55-3	55-1	54-7	54-5	54-3	54-1	53-7	53-4	53-1	52-7	52-5	52-3

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
56-0	1-2	51-0	50-5	50-3	50-1	49-7	49-4	49-2	49-0	48-6	48-4	48-1	47-7	47-5	47-3	47-0	46-6
56-1	1-3	51-1	50-6	50-4	50-2	50-0	49-5	49-3	49-1	48-7	48-4	48-2	48-0	47-6	47-3	47-1	46-7
56-2	1-4	51-2	50-7	50-5	50-3	50-1	49-6	49-4	49-2	49-0	48-5	48-3	48-1	47-7	47-4	47-2	47-0
56-3	1-5	51-2	51-0	50-6	50-4	50-1	49-7	49-5	49-3	49-0	48-6	48-4	48-2	47-7	47-5	47-3	47-1
56-4	1-6	51-3	51-1	50-7	50-5	50-2	50-0	49-6	49-4	49-1	48-7	48-5	48-2	48-0	47-6	47-4	47-1
56-5	1-6	51-4	51-2	51-0	50-6	50-3	50-1	49-7	49-4	49-2	49-0	48-6	48-3	48-1	47-7	47-5	47-2
56-6	1-7	51-5	51-3	51-1	50-6	50-4	50-2	50-0	49-5	49-3	49-1	48-6	48-4	48-2	48-0	47-5	47-3
56-7	2-0	51-6	51-4	51-1	50-7	50-5	50-3	50-0	49-6	49-4	49-2	48-7	48-5	48-3	48-0	47-6	47-4

Yd	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
56-0	6-4	46-2	45-7	45-5	45-3	45-1	44-6	44-4	44-2	44-0	43-5	43-3	43-1	42-7	42-4	42-2	42-0
56-1	6-5	46-2	46-0	45-6	45-4	45-1	44-7	44-5	44-3	44-0	43-6	43-4	43-2	42-7	42-5	42-3	42-1
56-2	6-6	46-3	46-1	45-7	45-5	45-2	45-0	44-6	44-4	44-1	43-7	43-5	43-3	43-0	42-6	42-4	42-2
56-3	6-6	46-4	46-2	46-0	45-5	45-3	45-1	44-7	44-4	44-2	44-0	43-6	43-3	43-1	42-7	42-5	42-2
56-4	6-7	46-5	46-3	46-0	45-6	45-4	45-2	44-7	44-5	44-3	44-1	43-6	43-4	43-2	43-0	42-5	42-3
56-5	7-0	46-6	46-3	46-1	45-7	45-5	45-2	45-0	44-6	44-4	44-1	43-7	43-5	43-3	43-0	42-6	42-4
56-6	7-1	46-7	46-4	46-2	46-0	45-5	45-3	45-1	44-7	44-4	44-2	44-0	43-6	43-3	43-1	42-7	42-5
56-7	7-2	46-7	46-5	46-3	46-1	45-6	45-4	45-2	44-7	44-5	44-3	44-1	43-6	43-4	43-2	43-0	42-5

57 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
57-0	56-6	56-3	56-1	55-7	55-5	55-2	55-0	54-6	54-4	54-1	53-7	53-5	53-2	53-0	52-6	52-4
57-1	56-7	56-4	56-2	56-0	55-6	55-3	55-1	54-7	54-5	54-2	54-0	53-6	53-3	53-1	52-7	52-4
57-2	57-0	56-5	56-3	56-1	55-7	55-4	55-2	55-0	54-6	54-3	54-1	53-7	53-4	53-2	53-0	52-5
57-3	57-1	56-6	56-4	56-2	56-0	55-5	55-3	55-1	54-7	54-4	54-2	54-0	53-5	53-3	53-1	52-6
57-4	57-2	56-7	56-5	56-3	56-1	55-6	55-4	55-2	54-7	54-5	54-3	54-0	53-6	53-4	53-2	52-7
57-5	57-3	57-0	56-6	56-4	56-1	55-7	55-5	55-3	55-0	54-6	54-4	54-1	53-7	53-5	53-2	53-0
57-6	57-4	57-1	56-7	56-5	56-2	56-0	55-6	55-4	55-1	54-7	54-5	54-2	54-0	53-6	53-3	53-1
57-7	57-5	57-2	57-0	56-6	56-3	56-1	55-7	55-5	55-2	55-0	54-6	54-3	54-1	53-7	53-4	53-2

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
57-0	52-1	51-7	51-5	51-2	51-0	50-6	50-4	50-1	49-7	49-5	49-2	49-0	48-6	48-4	48-1	47-7	47-5
57-1	52-2	52-0	51-6	51-3	51-1	50-7	50-4	50-2	50-0	49-6	49-3	49-1	48-7	48-4	48-2	48-0	47-6
57-2	52-3	52-1	51-6	51-4	51-2	51-0	50-5	50-3	50-1	49-6	49-4	49-2	49-0	48-5	48-3	48-1	47-6
57-3	52-4	52-2	51-7	51-5	51-3	51-1	50-6	50-4	50-2	49-7	49-5	49-3	49-0	48-6	48-4	48-2	47-7
57-4	52-5	52-3	52-0	51-6	51-4	51-1	50-7	50-5	50-3	50-0	49-6	49-4	49-1	48-7	48-5	48-2	48-0
57-5	52-6	52-3	52-1	51-7	51-5	51-2	51-0	50-6	50-4	50-1	49-7	49-5	49-2	49-0	48-6	48-3	48-1
57-6	52-7	52-4	52-2	52-0	51-5	51-3	51-1	50-7	50-4	50-2	50-0	49-5	49-3	49-1	48-6	48-4	48-2
57-7	53-0	52-5	52-3	52-1	51-6	51-4	51-2	50-7	50-5	50-3	50-0	49-6	49-4	49-2	48-7	48-5	48-3

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
57-0	47-2	47-0	46-6	46-4	46-1	45-7	45-5	45-3	45-0	44-6	44-4	44-1	43-7	43-5	43-3	43-0	42-6
57-1	47-3	47-1	46-7	46-4	46-2	46-0	45-6	45-3	45-1	44-7	44-4	44-2	44-0	43-6	43-3	43-1	42-7
57-2	47-4	47-2	47-0	46-5	46-3	46-1	45-6	45-4	45-2	45-0	44-5	44-3	44-1	43-6	43-4	43-2	43-0
57-3	47-5	47-3	47-0	46-6	46-4	46-1	45-7	45-5	45-3	45-0	44-6	44-4	44-1	43-7	43-5	43-3	43-0
57-4	47-6	47-3	47-1	46-7	46-5	46-2	46-0	45-6	45-3	45-1	44-7	44-5	44-2	44-0	43-6	43-3	43-1
57-5	47-7	47-4	47-2	47-0	46-5	46-3	46-1	45-6	45-4	45-2	45-0	44-5	44-3	44-1	43-6	43-4	43-2
57-6	47-7	47-5	47-3	47-1	46-6	46-4	46-2	45-7	45-5	45-3	45-0	44-6	44-4	44-1	43-7	43-5	43-3
57-7	48-0	47-6	47-4	47-1	46-7	46-5	46-2	46-0	45-6	45-3	45-1	44-7	44-5	44-2	44-0	43-6	43-3

58 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
58-0	57-6	57-3	57-1	56-7	56-4	56-2	56-0	55-5	55-3	55-1	54-6	54-4	54-2	54-0	53-5	53-3
58-1	57-7	57-4	57-2	57-0	56-5	56-3	56-1	55-6	55-4	55-2	54-7	54-5	54-3	54-0	53-6	53-4
58-2	58-0	57-5	57-3	57-1	56-6	56-4	56-2	55-7	55-5	55-3	55-0	54-6	54-4	54-1	53-7	53-5
58-3	58-1	57-6	57-4	57-2	56-7	56-5	56-3	56-0	55-6	55-4	55-1	54-7	54-5	54-2	54-0	53-6
58-4	58-2	57-7	57-5	57-3	57-0	56-6	56-4	56-1	55-7	55-4	55-2	55-0	54-6	54-3	54-1	53-7
58-5	58-3	58-0	57-6	57-4	57-1	56-7	56-5	56-2	55-7	55-5	55-3	55-1	54-7	54-4	54-2	53-7
58-6	58-4	58-1	57-7	57-5	57-2	57-0	56-6	56-3	56-1	55-6	55-4	55-2	54-7	54-5	54-3	54-0
58-7	58-5	58-2	58-0	57-6	57-3	57-1	56-7	56-4	56-2	55-7	55-5	55-3	55-0	54-6	54-4	54-1

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
58-0	53-1	52-6	52-4	52-2	51-7	51-5	51-3	51-0	50-6	50-4	50-1	49-7	49-5	49-2	49-0	48-6	48-3
58-1	53-1	52-7	52-5	52-3	52-0	51-6	51-4	51-1	50-7	50-5	50-2	50-0	49-6	49-3	49-1	48-7	48-4
58-2	53-2	53-0	52-6	52-3	52-1	51-7	51-4	51-2	51-0	50-5	50-3	50-1	49-6	49-4	49-2	48-7	48-5
58-3	53-3	53-1	52-7	52-4	52-2	52-0	51-5	51-3	51-1	50-6	50-4	50-2	49-7	49-5	49-3	49-0	48-6
58-4	53-4	53-2	53-0	52-5	52-3	52-1	51-6	51-4	51-2	50-7	50-5	50-2	50-0	49-6	49-3	49-1	48-7
58-5	53-5	53-3	53-0	52-6	52-4	52-1	51-7	51-5	51-2	51-0	50-6	50-3	50-1	49-7	49-4	49-2	49-0
58-6	53-6	53-4	53-1	52-7	52-5	52-2	52-0	51-6	51-3	51-1	50-7	50-4	50-2	50-0	49-5	49-3	49-0
58-7	53-7	53-5	53-2	53-0	52-6	52-3	52-1	51-6	51-4	51-2	50-7	50-5	50-3	50-0	49-6	49-4	49-1

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
58-0	48-1	47-7	47-4	47-2	47-0	46-6	46-3	46-1	45-7	45-4	45-2	45-0	44-5	44-3	44-1	43-6	43-4
58-1	48-2	48-0	47-5	47-3	47-1	46-6	46-4	46-2	45-7	45-5	45-3	45-0	44-6	44-4	44-1	43-7	43-5
58-2	48-3	48-0	47-6	47-4	47-1	46-7	46-5	46-2	46-0	45-6	45-3	45-1	44-7	44-4	44-2	44-0	43-6
58-3	48-4	48-1	47-7	47-5	47-2	47-0	46-6	46-3	46-1	45-7	45-4	45-2	45-0	44-5	44-3	44-1	43-6
58-4	48-4	48-2	48-0	47-5	47-3	47-1	46-6	46-4	46-2	45-7	45-5	45-2	45-0	44-6	44-4	44-1	43-7
58-5	48-5	48-3	48-1	47-6	47-4	47-2	46-7	46-5	46-3	46-0	45-6	45-3	45-1	44-7	44-4	44-2	44-0
58-6	48-6	48-4	48-1	47-7	47-5	47-2	47-0	46-6	46-3	46-1	45-7	45-4	45-2	45-0	44-5	44-3	44-1
58-7	48-7	48-5	48-2	48-0	47-6	47-3	47-1	46-6	46-4	46-2	45-7	45-5	45-3	45-0	44-6	44-4	44-1

59 Yd

Yd	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
59-0	58-6	58-3	58-1	57-7	57-4	57-2	56-7	56-5	56-3	56-0	55-6	55-4	55-1	54-7	54-5	54-2
59-1	58-7	58-4	58-2	58-0	57-5	57-3	57-0	56-6	56-4	56-1	55-7	55-5	55-2	55-0	54-6	54-3
59-2	59-0	58-5	58-3	58-1	57-6	57-4	57-1	56-7	56-5	56-2	56-0	55-6	55-3	55-1	54-6	54-4
59-3	59-1	58-6	58-4	58-2	57-7	57-5	57-2	57-0	56-6	56-3	56-1	55-6	55-4	55-2	54-7	54-5
59-4	59-2	58-7	58-5	58-2	58-0	57-6	57-3	57-1	56-7	56-4	56-2	55-7	55-5	55-3	55-0	54-6
59-5	59-3	59-0	58-6	58-3	58-1	57-7	57-4	57-2	57-0	56-5	56-3	56-0	55-6	55-4	55-1	54-7
59-6	59-4	59-1	58-7	58-4	58-2	58-0	57-5	57-3	57-1	56-6	56-4	56-1	55-7	55-5	55-2	55-0
59-7	59-5	59-2	59-0	58-5	58-3	58-1	57-6	57-4	57-2	56-7	56-5	56-2	56-0	55-5	55-3	55-1

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
59-0	54-0	53-6	53-3	53-1	52-6	52-4	52-2	51-7	51-5	51-3	51-0	50-6	50-4	50-1	49-7	49-4	49-2
59-1	54-1	53-6	53-4	53-2	52-7	52-5	52-3	52-0	51-6	51-4	51-1	50-7	50-4	50-2	50-0	49-5	49-3
59-2	54-2	53-7	53-5	53-3	53-0	52-6	52-3	52-1	51-7	51-4	51-2	51-0	50-5	50-3	50-1	49-6	49-4
59-3	54-3	54-0	53-6	53-4	53-1	52-7	52-4	52-2	52-0	51-5	51-3	51-1	50-6	50-4	50-1	49-7	49-5
59-4	54-4	54-1	53-7	53-4	53-2	53-0	52-5	52-3	52-1	51-6	51-4	51-2	50-7	50-5	50-2	50-0	49-5
59-5	54-4	54-2	54-0	53-5	53-3	53-1	52-6	52-4	52-1	51-7	51-5	51-2	51-0	50-5	50-3	50-1	49-6
59-6	54-5	54-3	54-1	53-6	53-4	53-1	52-7	52-5	52-2	52-0	51-5	51-3	51-1	50-6	50-4	50-2	49-7
59-7	54-6	54-4	54-1	53-7	53-5	53-2	53-0	52-6	52-3	52-1	51-6	51-4	51-2	50-7	50-5	50-2	50-0

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
59-0	49-0	48-5	48-3	48-1	47-6	47-4	47-2	46-7	46-5	46-3	46-0	45-6	45-3	45-1	44-7	44-4	44-2
59-1	49-1	48-6	48-4	48-1	47-7	48-5	47-2	47-0	46-6	46-3	46-1	45-7	45-4	45-2	44-7	44-5	44-3
59-2	49-1	48-7	48-5	48-2	48-0	47-6	47-3	47-1	46-6	46-4	46-2	45-7	45-5	45-3	45-0	44-6	44-4
59-3	49-2	49-0	48-6	48-3	48-1	47-6	47-4	47-2	46-7	46-5	46-3	46-0	45-6	45-3	45-1	44-7	44-4
59-4	49-3	49-1	48-6	48-4	48-2	47-7	47-5	47-2	47-0	46-6	46-3	46-1	45-7	45-4	45-2	44-7	44-5
59-5	49-4	49-2	48-7	48-5	48-2	48-0	47-6	47-3	47-1	46-6	46-4	46-2	45-7	45-5	45-3	45-0	44-6
59-6	49-5	49-2	49-0	48-6	48-3	48-1	47-6	47-4	47-2	46-7	46-5	46-2	46-0	45-6	45-3	45-1	44-7
59-7	49-6	49-3	49-1	48-6	48-4	48-2	47-7	47-5	47-2	47-0	46-6	46-3	46-1	45-6	45-4	45-2	44-7

60 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
60-0	59-6	59-3	59-1	58-6	58-4	58-2	57-7	57-5	57-2	57-0	56-6	56-3	56-1	55-6	55-4	55-2
60-1	59-7	59-4	59-2	58-7	58-5	58-3	58-0	57-6	57-3	57-1	56-7	56-4	56-2	55-7	55-5	55-3
60-2	60-0	59-5	59-3	59-0	58-6	58-4	58-1	57-7	57-4	57-2	57-0	56-5	56-3	56-0	55-6	55-3
60-3	60-1	59-6	59-4	59-1	58-7	58-5	58-2	58-0	57-5	57-3	57-1	56-6	56-4	56-1	55-7	55-4
60-4	60-2	59-7	59-5	59-2	59-0	58-6	58-3	58-1	57-6	57-4	57-2	56-7	56-5	56-2	56-0	55-5
60-5	60-3	60-0	59-6	59-3	59-1	58-7	58-4	58-2	57-7	57-5	57-3	57-0	56-5	56-3	56-1	55-6
60-6	60-4	60-1	59-7	59-4	59-2	59-0	58-5	58-3	58-0	57-6	57-4	57-1	56-6	56-4	56-2	55-7
60-7	60-5	60-2	60-0	59-5	59-3	59-1	58-6	58-4	58-1	57-7	57-5	57-2	56-7	56-5	56-2	56-0

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
60-0	54-7	54-5	54-2	54-0	53-6	53-3	53-1	52-6	52-4	52-2	51-7	51-5	51-2	51-0	50-6	50-3	50-1
60-1	55-0	54-6	54-3	54-1	53-6	53-4	53-2	52-7	52-5	52-2	52-0	51-6	51-3	51-1	50-6	50-4	50-2
60-2	55-1	54-7	54-4	54-2	53-7	53-5	53-3	53-0	52-6	52-3	52-1	51-7	51-4	51-2	50-7	50-5	50-2
60-3	55-2	55-0	54-5	54-3	54-0	53-6	53-3	53-1	52-7	52-4	52-2	51-7	51-5	51-3	51-0	50-6	50-3
60-4	55-3	55-0	54-6	54-4	54-1	53-7	53-4	53-2	53-0	52-5	52-3	52-0	51-6	51-3	51-1	50-7	50-4
60-5	55-4	55-1	54-7	54-4	54-2	54-0	53-5	53-3	53-0	52-6	52-4	52-1	51-7	51-4	51-2	50-7	50-5
60-6	55-5	55-2	55-0	54-5	54-3	54-1	53-6	53-4	53-1	52-7	52-4	52-2	52-0	51-5	51-3	51-0	50-6
60-7	55-6	55-3	55-1	54-6	54-4	54-1	53-7	53-5	53-2	53-0	52-5	52-3	52-0	51-6	51-4	51-1	50-7

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
60-0	49-6	49-4	49-2	48-7	48-5	48-2	48-0	47-6	47-3	47-1	46-6	46-4	46-2	45-7	45-5	45-2	45-0
60-1	49-7	49-5	49-2	49-0	48-6	48-3	48-1	47-6	47-4	47-2	46-7	46-5	46-2	46-0	45-6	45-3	45-1
60-2	50-0	49-6	49-3	49-1	48-6	48-4	48-2	47-7	47-5	47-2	47-0	46-6	46-3	46-1	45-6	45-4	45-2
60-3	50-1	49-6	49-4	49-2	48-7	48-5	48-2	48-0	47-6	47-3	47-1	46-6	46-4	46-1	45-7	45-5	45-2
60-4	50-2	49-7	49-5	49-2	49-0	48-6	48-3	48-1	47-6	47-4	47-2	46-7	46-5	46-2	46-0	45-5	45-3
60-5	50-3	50-0	49-6	49-3	49-1	48-6	48-4	48-2	47-7	47-5	47-2	47-0	46-5	46-3	46-1	45-6	45-4
60-6	50-3	50-1	49-7	49-4	49-2	48-7	48-5	48-2	48-0	47-6	47-3	47-1	46-6	46-4	46-1	45-7	45-5
60-7	50-4	50-2	49-7	49-5	49-2	49-0	48-6	48-3	48-1	47-6	47-4	47-1	46-7	46-5	46-2	46-0	45-5

61 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
61-0	60-6	60-3	60-1	59-6	59-4	59-2	58-7	58-4	58-2	58-0	57-5	57-3	57-0	56-6	56-3	56-1
61-1	60-7	60-4	60-2	59-7	59-5	59-3	59-0	58-5	58-3	58-1	57-6	57-4	57-1	56-7	56-4	56-2
61-2	61-0	60-5	60-3	60-0	59-6	59-4	59-1	58-6	58-4	58-2	57-7	57-5	57-2	57-0	56-5	56-3
61-3	61-1	60-6	60-4	60-1	59-7	59-5	59-2	58-7	58-5	58-3	58-0	57-6	57-3	57-1	56-6	56-4
61-4	61-2	60-7	60-5	60-2	60-0	59-6	59-3	59-0	58-6	58-4	58-1	57-6	57-4	57-2	56-7	56-5
61-5	61-3	61-0	60-6	60-3	60-1	59-7	59-4	59-1	58-7	58-5	58-2	57-7	57-5	57-2	57-0	56-6
61-6	61-4	61-1	60-7	60-4	60-2	60-0	59-5	59-2	59-0	58-6	58-3	58-0	57-6	57-3	57-1	56-6
61-7	61-5	61-2	61-0	60-5	60-3	60-1	59-6	59-3	59-1	58-7	58-4	58-1	57-7	57-4	57-2	56-7

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
61-0	55-7	55-4	55-2	54-7	54-5	54-2	54-0	53-5	53-3	53-1	52-6	52-4	52-1	51-7	51-4	51-2	50-7
61-1	55-7	55-5	55-3	55-0	54-6	54-3	54-1	53-6	53-4	53-1	52-7	52-5	52-2	52-0	51-5	51-3	51-0
61-2	56-0	55-6	55-3	55-1	54-7	54-4	54-2	53-7	53-5	53-2	53-0	52-5	52-3	52-1	51-6	51-4	51-1
61-3	56-1	55-7	55-4	55-2	54-7	54-5	54-3	54-0	53-6	53-3	53-1	52-6	52-4	52-1	51-7	51-4	51-2
61-4	56-2	56-0	55-5	55-3	55-0	54-6	54-3	54-1	53-7	53-4	53-2	52-7	52-5	52-2	52-0	51-5	51-3
61-5	56-3	56-1	55-6	55-4	55-1	54-7	54-4	54-2	53-7	53-5	53-2	53-0	52-6	52-3	52-1	51-6	51-4
61-6	56-4	56-2	55-7	55-5	55-2	55-0	54-5	54-3	54-0	53-6	53-3	53-1	52-6	52-4	52-1	51-7	51-4
61-7	56-5	56-2	56-0	55-5	55-3	55-1	54-6	54-4	54-1	53-7	53-4	53-2	52-7	52-5	52-2	52-0	51-5

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
61-0	50-5	50-3	50-0	49-6	49-3	49-1	48-6	48-4	48-2	47-7	47-5	47-2	47-0	46-5	46-3	46-0	45-6
61-1	50-6	50-3	50-1	49-7	49-4	49-2	48-7	48-5	48-2	48-0	47-5	47-3	47-1	46-6	46-4	46-1	45-7
61-2	50-7	50-4	50-2	49-7	49-5	49-2	49-0	48-6	48-3	48-1	47-6	47-4	47-1	46-7	46-4	46-2	46-0
61-3	51-0	50-5	50-3	50-0	49-6	49-3	49-1	48-6	48-4	48-1	47-7	47-5	47-2	47-0	46-5	46-3	46-0
61-4	51-0	50-6	50-3	50-1	49-7	49-4	49-2	48-7	48-5	48-2	48-0	47-5	47-3	47-0	46-6	46-3	46-1
61-5	51-1	50-7	50-4	50-2	49-7	49-5	49-2	49-0	48-5	48-3	48-1	47-6	47-4	47-1	46-7	46-4	46-2
61-6	51-2	51-0	50-5	50-3	50-0	49-6	49-3	49-1	48-6	48-4	48-1	47-7	47-4	47-2	46-7	46-5	46-3
61-7	51-3	51-0	50-6	50-3	50-1	49-6	49-4	49-2	48-7	48-5	48-2	48-0	47-5	47-3	47-0	46-6	46-3

62 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
62-0	61-6	61-3	61-1	60-6	60-4	60-1	59-7	59-4	59-2	58-7	58-5	58-2	58-0	57-5	57-3	57-0
62-1	61-7	61-4	61-2	60-7	60-5	60-2	60-0	59-5	59-3	59-0	58-6	58-3	58-1	57-6	57-4	57-1
62-2	62-0	61-5	61-3	61-0	60-6	60-3	60-1	59-6	59-4	59-1	58-7	58-4	58-2	57-7	57-5	57-2
62-3	62-1	61-6	61-4	61-1	60-7	60-4	60-2	59-7	59-5	59-2	59-0	58-5	58-3	58-0	57-6	57-3
62-4	62-2	61-7	61-5	61-2	61-0	60-5	60-3	60-0	59-6	59-3	59-1	58-6	58-4	58-1	57-7	57-4
62-5	62-2	62-0	61-5	61-3	61-1	60-6	60-4	60-1	59-7	59-4	59-2	58-7	58-4	58-2	57-7	57-5
62-6	62-3	62-1	61-6	61-4	61-2	60-7	60-5	60-2	60-0	59-5	59-3	59-0	58-5	58-3	58-0	57-6
62-7	62-4	62-2	61-7	61-5	61-3	61-0	60-6	60-3	60-1	59-6	59-4	59-1	58-6	58-4	58-1	57-7

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
62-0	56-6	56-3	56-1	55-6	55-4	55-1	54-7	54-4	54-2	54-0	53-5	53-3	53-0	52-6	52-3	52-1	51-6
62-1	56-7	56-4	56-2	55-7	55-5	55-2	55-0	54-5	54-3	54-0	53-6	53-3	53-1	52-6	52-4	52-1	51-7
62-2	57-0	56-5	56-3	56-0	55-6	55-3	55-1	54-6	54-4	54-1	53-7	53-4	53-2	52-7	52-5	52-2	52-0
62-3	57-1	56-6	56-4	56-1	55-7	55-4	55-2	54-7	54-5	54-2	54-0	53-5	53-3	53-0	52-6	52-3	52-1
62-4	57-2	56-7	56-5	56-2	56-0	55-5	55-3	55-0	54-6	54-3	54-1	53-6	53-4	53-1	52-7	52-4	52-2
62-5	57-2	57-0	56-5	56-3	56-0	55-6	55-3	55-1	54-6	54-4	54-1	53-7	53-4	53-2	52-7	52-5	52-2
62-6	57-3	57-1	56-6	56-4	56-1	55-7	55-4	55-2	54-7	54-5	54-2	54-0	53-5	53-3	53-0	52-6	52-3
62-7	57-4	57-2	56-7	56-5	56-2	56-0	55-5	55-3	55-0	54-6	54-3	54-1	53-6	53-4	53-1	52-7	52-4

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
62-0	51-4	51-1	50-7	50-4	50-2	49-7	49-5	49-2	49-0	48-5	48-3	48-0	47-6	47-3	47-1	46-6	46-4
62-1	51-5	51-2	51-0	50-5	50-3	50-0	49-6	49-3	49-1	48-6	48-4	48-1	47-7	47-4	47-2	46-7	46-5
62-2	51-5	51-3	51-0	50-6	50-3	50-1	49-6	49-4	49-1	48-7	48-4	48-2	47-7	47-5	47-2	47-0	46-6
62-3	51-6	51-4	51-1	50-7	50-4	50-2	49-7	49-5	49-2	49-0	48-5	48-3	48-0	47-6	47-3	47-1	46-6
62-4	51-7	51-5	51-2	51-0	50-5	50-3	50-0	49-6	49-3	49-1	48-6	48-4	48-1	47-7	47-4	47-2	46-7
62-5	52-0	51-5	51-3	51-0	50-6	50-3	50-1	49-6	49-4	49-1	48-7	48-4	48-2	47-7	47-5	47-2	47-0
62-6	52-1	51-6	51-4	51-1	50-7	50-4	50-2	49-7	49-5	49-2	49-0	48-5	48-3	48-0	47-6	47-3	47-1
62-7	52-1	51-7	51-4	51-2	50-7	50-5	50-2	50-0	49-5	49-3	49-0	48-6	48-3	48-1	47-6	47-4	47-1

63 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
63-0	62-5	62-3	62-0	61-6	61-3	61-1	60-6	60-4	60-1	59-7	59-4	59-2	58-7	58-5	58-2	58-0
63-1	62-6	62-4	62-1	61-7	61-4	61-2	60-7	60-5	60-2	60-0	59-5	59-3	59-0	58-6	58-3	58-1
63-2	62-7	62-5	62-2	62-0	61-5	61-3	61-0	60-6	60-3	60-1	59-6	59-4	59-1	58-7	58-4	58-2
63-3	63-0	62-6	62-3	62-1	61-6	61-4	61-1	60-7	60-4	60-2	59-7	59-5	59-2	59-0	58-5	58-2
63-4	63-1	62-7	62-4	62-2	61-7	61-5	61-2	61-0	60-5	60-3	60-0	59-6	59-3	59-0	58-6	58-3
63-5	63-2	63-0	62-5	62-3	62-0	61-6	61-3	61-1	60-6	60-4	60-1	59-6	59-4	59-1	58-7	58-4
63-6	63-3	63-1	62-6	62-4	62-1	61-7	61-4	61-2	60-7	60-5	60-2	59-7	59-5	59-2	59-0	58-5
63-7	63-4	63-2	62-7	62-5	62-2	62-0	61-5	61-3	61-0	60-6	60-3	60-0	59-6	59-3	59-1	58-6

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
63-0	57-5	57-3	57-0	56-6	56-3	56-1	55-6	55-4	55-1	54-6	54-4	54-1	53-7	53-4	53-2	52-7	52-5
63-1	57-6	57-4	57-1	56-7	56-4	56-1	55-7	55-4	55-2	54-7	54-5	54-2	54-0	53-5	53-3	53-0	52-6
63-2	57-7	57-4	57-2	56-7	56-5	56-2	56-0	55-5	55-3	55-0	54-6	54-3	54-1	53-6	53-4	53-1	52-7
63-3	58-0	57-5	57-3	57-0	56-6	56-3	56-1	55-6	55-4	55-1	54-7	54-4	54-2	53-7	53-4	53-2	52-7
63-4	58-1	57-6	57-4	57-1	56-7	56-4	56-2	55-7	55-5	55-2	54-7	54-5	54-2	54-0	53-5	53-3	53-0
63-5	58-2	57-7	57-5	57-2	57-0	56-5	56-2	56-0	55-5	55-3	55-0	54-6	54-3	54-1	53-6	53-3	53-1
63-6	58-3	58-0	57-6	57-3	57-0	56-6	56-3	56-1	55-6	55-4	55-1	54-7	54-4	54-2	53-7	53-4	53-2
63-7	58-4	58-1	57-6	57-4	57-1	56-7	56-4	56-2	55-7	55-5	55-2	54-7	54-5	54-2	54-0	53-5	53-3

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
63-0	52-2	52-0	51-5	51-3	51-0	50-6	50-3	50-1	49-6	49-4	49-1	48-7	48-4	48-2	47-7	47-5	47-2
63-1	52-3	52-1	51-6	51-4	51-1	50-7	50-4	50-1	49-7	49-4	49-2	48-7	48-5	48-2	48-0	47-5	47-3
63-2	52-4	52-1	51-7	51-4	51-2	50-7	50-5	50-2	50-0	49-5	49-3	49-0	48-6	48-3	48-1	47-6	47-3
63-3	52-5	52-2	52-0	51-5	51-3	51-0	50-6	50-3	50-1	49-6	49-3	49-1	48-6	48-4	48-1	47-7	47-4
63-4	52-6	52-3	52-1	51-6	51-3	51-1	50-6	50-4	50-1	49-7	49-4	49-2	48-7	48-5	48-2	48-0	47-5
63-5	52-6	52-4	52-1	51-7	51-4	51-2	50-7	50-5	50-2	50-0	49-5	49-2	49-0	48-5	48-3	48-0	47-6
63-6	52-7	52-5	52-2	52-0	51-5	51-3	51-0	50-5	50-3	50-0	49-6	49-3	49-1	48-6	48-4	48-1	47-6
63-7	53-0	52-6	52-3	52-0	51-6	51-3	51-1	50-6	50-4	50-1	49-7	49-4	49-1	48-7	48-4	48-2	47-7

64 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
64-0	63-5	63-3	63-0	62-6	62-3	62-1	61-6	61-4	61-1	60-6	60-4	60-1	59-7	59-4	59-2	58-7
64-1	63-6	63-4	63-1	62-7	62-4	62-2	61-7	61-4	61-2	60-7	60-5	60-2	60-0	59-5	59-3	59-0
64-2	63-7	63-5	63-2	63-0	62-5	62-3	62-0	61-5	61-3	61-0	60-6	60-3	60-1	59-6	59-3	59-1
64-3	64-0	63-6	63-3	63-1	62-6	62-4	62-1	61-6	61-4	61-2	60-7	60-4	60-2	59-7	59-4	59-2
64-4	64-1	63-7	63-4	63-2	62-7	62-4	62-2	61-7	61-5	61-3	61-0	60-5	60-2	60-0	59-5	59-3
64-5	64-2	64-0	63-5	63-3	63-0	62-5	62-3	62-0	61-6	61-4	61-1	60-6	60-3	60-1	59-6	59-4
64-6	64-3	64-1	63-6	63-4	63-1	62-6	62-4	62-1	61-7	61-5	61-2	60-7	60-4	60-2	59-7	59-5
64-7	64-4	64-2	63-7	63-5	63-2	62-7	62-5	62-2	62-0	61-5	61-2	61-0	60-5	60-3	60-0	59-5

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
64-0	58-4	58-2	57-7	57-5	57-2	57-0	56-5	56-3	56-0	55-5	55-3	55-0	54-6	54-3	54-1	53-6	53-4
64-1	58-5	58-3	58-0	57-6	57-3	57-1	56-6	56-3	56-1	55-6	55-4	55-1	54-7	54-4	54-1	53-7	53-4
64-2	58-6	58-4	58-1	57-7	57-4	57-1	56-7	56-4	56-2	55-7	55-5	55-2	55-0	54-5	54-2	54-0	53-5
64-3	58-7	58-5	58-2	58-0	57-5	57-2	57-0	56-5	56-3	56-0	55-5	55-3	55-0	54-6	54-3	54-1	53-6
64-4	59-0	58-6	58-3	58-0	57-6	57-3	57-1	56-6	56-4	56-1	55-6	55-4	55-1	54-7	54-4	54-1	53-7
64-5	59-1	58-6	58-4	58-1	57-7	57-4	57-2	56-7	56-4	56-2	55-7	55-5	55-2	54-7	54-5	54-2	54-0
64-6	59-2	58-7	58-5	58-2	58-0	57-5	57-2	57-0	56-5	56-3	56-0	55-5	55-3	55-0	54-6	54-3	54-1
64-7	59-3	59-0	58-6	58-3	58-1	57-6	57-3	57-1	56-6	56-4	56-1	55-6	55-4	55-1	54-7	54-4	54-1

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
64-0	53-1	52-6	52-4	52-1	51-7	51-4	51-2	50-7	50-4	50-2	49-7	49-5	49-2	49-0	48-5	48-3	48-0
64-1	53-2	52-7	52-5	52-2	52-0	51-5	51-2	51-0	50-5	50-3	50-0	49-6	49-3	49-0	48-6	48-3	48-1
64-2	53-3	53-0	52-5	52-3	52-0	51-6	51-3	51-1	50-6	50-3	50-1	49-6	49-4	49-1	48-7	48-4	48-2
64-3	53-3	53-1	52-6	52-4	52-1	51-7	51-4	51-1	50-7	50-4	50-2	49-7	49-5	49-2	48-7	48-5	48-2
64-4	53-4	53-2	52-7	52-5	52-2	52-0	51-5	51-2	51-0	50-5	50-2	50-0	49-5	49-3	49-0	48-6	48-3
64-5	53-5	53-3	53-0	52-5	52-3	52-0	51-6	51-3	51-0	50-6	50-3	50-1	49-6	49-4	49-1	48-6	48-4
64-6	53-6	53-3	53-1	52-6	52-4	52-1	51-6	51-4	51-1	50-7	50-4	50-1	49-7	49-4	49-2	48-7	48-5
64-7	53-7	53-4	53-2	52-7	52-4	52-2	51-7	51-5	51-2	50-7	50-5	50-2	50-0	49-5	49-2	49-0	48-5

65 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
65-0	64-5	64-3	64-0	63-6	63-3	63-0	62-6	62-3	62-1	61-6	61-3	61-1	60-6	60-4	60-1	59-6
65-1	64-6	64-4	64-1	63-7	63-4	63-1	62-7	62-4	62-2	61-7	61-4	61-2	60-7	60-5	60-2	59-7
65-2	64-7	64-5	64-2	64-0	63-5	63-2	63-0	62-5	62-3	62-0	61-5	61-3	61-0	60-5	60-3	60-0
65-3	65-0	64-6	64-3	64-1	63-6	63-3	63-1	62-6	62-4	62-1	61-6	61-4	61-1	60-6	60-4	60-1
65-4	65-1	64-7	64-4	64-2	63-7	63-4	63-2	62-7	62-4	62-2	61-7	61-4	61-2	60-7	60-5	60-2
65-5	65-2	65-0	64-5	64-3	64-0	63-5	63-3	63-0	62-5	62-3	62-0	61-5	61-3	61-0	60-6	60-3
65-6	65-3	65-1	64-6	64-3	64-1	63-6	63-4	63-1	62-6	62-4	62-1	61-6	61-4	61-1	60-7	60-4
65-7	65-4	65-2	64-7	64-4	64-2	63-7	63-5	63-2	62-7	62-5	62-2	61-7	61-5	61-2	60-7	60-5

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
65-0	59-4	59-1	58-7	58-4	58-1	57-7	57-4	57-2	56-7	56-4	56-2	55-7	55-5	55-2	54-7	54-5	54-2
65-1	59-5	59-2	59-0	58-5	58-2	58-0	57-5	57-2	57-0	56-5	56-3	56-0	55-5	55-3	55-0	54-6	54-3
65-2	59-6	59-3	59-0	58-6	58-3	58-1	57-6	57-3	57-1	56-6	56-4	56-1	55-6	55-4	55-1	54-6	54-4
65-3	59-7	59-4	59-1	58-7	58-4	58-1	57-7	57-4	57-2	56-7	56-4	56-2	55-7	55-5	55-2	54-7	54-5
65-4	59-7	59-5	59-2	59-0	58-5	58-2	58-0	57-5	57-3	57-0	56-5	56-3	56-0	55-5	55-3	55-0	54-6
65-5	60-0	59-6	59-3	59-1	58-6	58-3	58-1	57-6	57-3	57-1	56-6	56-4	56-1	55-6	55-4	55-1	54-6
65-6	60-1	59-7	59-4	59-1	58-7	58-4	58-2	57-7	57-4	57-2	56-7	56-4	56-2	55-7	55-4	55-2	54-7
65-7	60-2	60-0	59-5	59-2	59-0	58-5	58-2	58-0	57-5	57-2	57-0	56-5	56-3	56-0	55-5	55-3	55-0

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
65-0	54-0	53-5	53-2	53-0	52-5	52-3	52-0	51-5	51-3	51-0	50-6	50-3	50-0	49-6	49-3	49-1	48-6
65-1	54-0	53-6	53-3	53-1	52-6	52-3	52-1	51-6	51-4	51-1	50-6	50-4	50-1	49-7	49-4	49-1	48-7
65-2	54-1	53-7	53-4	53-1	52-7	52-4	52-2	51-7	51-4	51-2	50-7	50-5	50-2	49-7	49-5	49-2	49-0
65-3	54-2	53-7	53-5	53-2	53-0	52-5	52-2	52-0	51-5	51-3	51-0	50-5	50-3	50-0	49-5	49-3	49-0
65-4	54-3	54-0	53-6	53-3	53-0	52-6	52-3	52-1	51-6	51-3	51-1	50-6	50-3	50-1	49-6	49-4	49-1
65-5	54-4	54-1	53-7	53-4	53-1	52-7	52-4	52-1	51-7	51-4	51-2	50-7	50-4	50-2	49-7	49-4	49-2
65-6	54-5	54-2	53-7	53-5	53-2	52-7	52-5	52-2	52-0	51-5	51-2	51-0	50-5	50-2	50-0	49-5	49-3
65-7	54-5	54-3	54-0	53-6	53-3	53-0	52-6	52-3	52-0	51-6	51-3	51-0	50-6	50-3	50-1	49-6	49-3

66 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
66-0	65-5	65-3	65-0	64-5	64-3	64-0	63-6	63-3	63-0	62-6	62-3	62-0	61-6	61-3	61-0	60-6
66-1	65-6	65-4	65-1	64-6	64-4	64-1	63-7	63-4	63-1	62-7	62-4	62-1	61-7	61-4	61-1	60-7
66-2	65-7	65-5	65-2	64-7	64-5	64-2	64-0	63-5	63-2	63-0	62-5	62-2	62-0	61-5	61-2	61-0
66-3	66-0	65-6	65-3	65-0	64-6	64-3	64-1	63-6	63-3	63-1	62-6	62-3	62-0	61-6	61-3	61-1
66-4	66-1	65-7	65-4	65-1	64-7	64-4	64-1	63-7	63-4	63-1	62-7	62-4	62-1	61-7	61-4	61-1
66-5	66-2	66-0	65-5	65-2	65-0	64-5	64-2	64-0	63-5	63-2	63-0	62-5	62-2	62-0	61-5	61-2
66-6	66-3	66-1	65-6	65-3	65-1	64-6	64-3	64-1	63-6	63-3	63-1	62-6	62-3	62-1	61-6	61-3
66-7	66-4	66-2	65-7	65-4	65-2	64-7	64-4	64-2	63-7	63-4	63-2	62-7	62-4	62-2	61-7	61-4

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
66-0	60-3	60-0	59-6	59-3	59-1	58-6	58-3	58-1	57-6	57-3	57-1	56-6	56-3	56-1	55-6	55-4	55-1
66-1	60-4	60-1	59-7	59-4	59-1	58-7	58-4	58-2	57-7	57-4	57-2	56-7	56-4	56-2	55-7	55-4	55-2
66-2	60-5	60-2	60-0	59-5	59-2	59-0	58-5	58-3	58-0	57-5	57-2	57-0	56-5	56-3	56-0	55-5	55-3
66-3	60-6	60-3	60-1	59-6	59-3	59-1	58-6	58-3	58-1	57-6	57-3	57-1	56-6	56-3	56-1	55-6	55-3
66-4	60-7	60-4	60-2	59-7	59-4	59-1	58-7	58-4	58-2	57-7	57-4	57-2	56-7	56-4	56-2	55-7	55-4
66-5	61-0	60-5	60-2	60-0	59-5	59-2	59-0	58-5	58-2	58-0	57-5	57-2	57-0	56-5	56-2	56-0	55-5
66-6	61-1	60-6	60-3	60-1	59-6	59-3	59-1	58-6	58-3	58-1	57-6	57-3	57-1	56-6	56-3	56-1	55-6
66-7	61-2	60-7	60-4	60-2	59-7	59-4	59-2	58-7	58-4	58-1	57-7	57-4	57-1	56-7	56-4	56-1	55-7

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
66-0	54-6	54-4	54-1	53-6	53-4	53-1	52-6	52-4	52-1	51-6	51-4	51-1	50-7	50-4	50-1	49-7	49-4
66-1	54-7	54-4	54-2	53-7	53-4	53-2	52-7	52-5	52-2	51-7	51-5	51-2	50-7	50-5	50-2	49-7	49-5
66-2	55-0	54-5	54-3	54-0	53-5	53-3	53-0	52-5	52-3	52-0	51-5	51-3	51-0	50-5	50-3	50-0	49-6
66-3	55-1	54-6	54-3	54-1	53-6	53-3	53-1	52-6	52-3	52-1	51-6	51-4	51-1	50-6	50-4	50-1	49-6
66-4	55-2	54-7	54-4	54-2	53-7	53-4	53-2	52-7	52-4	52-2	51-7	51-4	51-2	50-7	50-4	50-2	49-7
66-5	55-2	55-0	54-5	54-2	54-0	53-5	53-2	53-0	52-5	52-2	52-0	51-5	51-2	51-0	50-5	50-2	50-0
66-6	55-3	55-1	54-6	54-3	54-1	53-6	53-3	53-1	52-6	52-3	52-1	51-6	51-3	51-1	50-6	50-3	50-1
66-7	55-4	55-1	54-7	54-4	54-1	53-7	53-4	53-1	52-7	52-4	52-1	51-7	51-4	51-1	50-7	50-4	50-1

67 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
67-0	66-5	66-3	66-0	65-5	65-3	65-0	64-5	64-3	64-0	63-5	63-3	63-0	62-5	62-2	62-0	61-5
67-1	66-6	66-4	66-1	65-6	65-4	65-1	64-6	64-4	64-1	63-6	63-4	63-1	62-6	62-3	62-1	61-6
67-2	66-7	66-5	66-2	65-7	65-5	65-2	64-7	64-5	64-2	63-7	63-5	63-2	62-7	62-4	62-2	61-7
67-3	67-0	66-6	66-3	66-0	65-6	65-3	65-0	64-6	64-3	64-0	63-6	63-3	63-0	62-5	62-3	62-0
67-4	67-1	66-7	66-4	66-1	65-6	65-4	65-1	64-6	64-4	64-1	63-6	63-4	63-1	62-6	62-4	62-1
67-5	67-2	67-0	66-5	66-2	65-7	65-5	65-2	64-7	64-5	64-2	63-7	63-5	63-2	62-7	62-4	62-2
67-6	67-3	67-1	66-6	66-3	66-0	65-6	65-3	65-0	64-6	64-3	64-0	63-6	63-3	63-0	62-5	62-3
67-7	67-4	67-2	66-7	66-4	66-1	65-7	65-4	65-1	64-7	64-4	64-1	63-6	63-4	63-1	62-6	62-4

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
67-0	61-2	61-0	60-5	60-2	60-0	59-5	59-2	59-0	58-5	58-2	58-0	57-5	57-2	57-0	56-5	56-2	56-0
67-1	61-3	61-1	60-6	60-3	60-1	59-6	59-3	59-1	58-6	58-3	58-1	57-6	57-3	57-0	56-6	56-3	56-0
67-2	61-4	61-2	60-7	60-4	60-2	59-7	59-4	59-1	58-7	58-4	58-1	57-7	57-4	57-1	56-7	56-4	56-1
67-3	61-5	61-3	61-0	60-5	60-2	60-0	59-5	59-2	59-0	58-5	58-2	58-0	57-5	57-2	56-7	56-5	56-2
67-4	61-6	61-3	61-1	60-6	60-3	60-1	59-6	59-3	59-1	58-6	58-3	58-0	57-6	57-3	57-0	56-6	56-3
67-5	61-7	61-4	61-2	60-7	60-4	60-2	59-7	59-4	59-1	58-7	58-4	58-1	57-7	57-4	57-1	56-6	56-4
67-6	62-0	61-5	61-3	61-0	60-5	60-3	60-0	59-5	59-2	59-0	58-5	58-2	57-7	57-5	57-2	56-7	56-5
67-7	62-1	61-6	61-3	61-1	60-6	60-3	60-1	59-6	59-3	59-0	58-6	58-3	58-0	57-6	57-3	57-0	56-5

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
67-0	55-5	55-2	55-0	54-5	54-2	53-7	53-5	53-2	52-7	52-5	52-2	51-7	51-5	51-2	50-7	50-5	50-2
67-1	55-6	55-3	55-0	54-6	54-3	54-0	53-6	53-3	53-0	52-6	52-3	52-0	51-5	51-3	51-0	50-5	50-3
67-2	55-7	55-4	55-1	54-6	54-4	54-1	53-6	53-4	53-1	52-6	52-4	52-1	51-6	51-4	51-1	50-6	50-4
67-3	55-7	55-5	55-2	54-7	54-5	54-2	53-7	53-5	53-2	52-7	52-4	52-2	51-7	51-4	51-2	50-7	50-4
67-4	56-0	55-6	55-3	55-0	54-5	54-3	54-0	53-5	53-3	53-0	52-5	52-3	52-0	51-5	51-2	51-0	50-5
67-5	56-1	55-6	55-4	55-1	54-6	54-4	54-1	53-6	53-3	53-1	52-6	52-3	52-1	51-6	51-3	51-0	50-6
67-6	56-2	55-7	55-4	55-2	54-7	54-4	54-2	53-7	53-4	53-1	52-7	52-4	52-1	51-7	51-4	51-1	50-7
67-7	56-3	56-0	55-5	55-3	55-0	54-5	54-2	54-0	53-5	53-2	53-0	52-5	52-2	51-7	51-5	51-2	50-7

68 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
68-0	67-5	67-3	67-0	66-5	66-2	66-0	65-5	65-2	65-0	64-5	64-3	63-7	63-5	63-2	62-7	62-4
68-1	67-6	67-4	67-1	66-6	66-3	66-1	65-6	65-3	65-1	64-6	64-3	64-0	63-6	63-3	63-0	62-5
68-2	67-7	67-5	67-2	66-7	66-4	66-2	65-7	65-4	65-2	64-7	64-4	64-1	63-7	63-4	63-1	62-6
68-3	68-0	67-6	67-3	67-0	66-5	66-3	66-0	65-5	65-3	65-0	64-5	64-2	63-7	63-5	63-2	62-7
68-4	68-1	67-7	67-4	67-1	66-6	66-3	66-1	65-6	65-3	65-1	64-6	64-3	64-0	63-6	63-3	63-0
68-5	68-2	68-0	67-5	67-2	66-7	66-4	66-2	65-7	65-4	65-2	64-7	64-4	64-1	63-7	63-4	63-1
68-6	68-3	68-1	67-6	67-3	67-0	66-5	66-3	66-0	65-5	65-3	65-0	64-5	64-2	64-0	63-5	63-2
68-7	68-4	68-1	67-7	67-4	67-1	66-6	66-4	66-1	65-6	65-4	65-1	64-6	64-3	64-0	63-6	63-3

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
68-0	62-2	61-7	61-4	61-2	60-7	60-4	60-1	59-7	59-4	59-1	58-7	58-4	58-1	57-6	57-4	57-1	56-6
68-1	62-3	62-0	61-5	61-3	61-0	60-5	60-2	60-0	59-5	59-2	58-7	58-5	58-2	57-7	57-5	57-2	56-7
68-2	62-4	62-1	61-6	61-3	61-1	60-6	60-3	60-0	59-6	59-3	59-0	58-6	58-3	58-0	57-5	57-3	57-0
68-3	62-5	62-2	61-7	61-4	61-2	60-7	60-4	60-1	59-7	59-4	59-1	58-6	58-4	58-1	57-6	57-3	57-1
68-4	62-5	62-3	62-0	61-5	61-2	61-0	60-5	60-2	60-0	59-5	59-2	58-7	58-5	58-2	57-7	57-4	57-2
68-5	62-6	62-4	62-1	61-6	61-3	61-1	60-6	60-3	60-0	59-6	59-3	59-0	58-5	58-3	58-0	57-5	57-2
68-6	62-7	62-5	62-2	61-7	61-4	61-2	60-7	60-4	60-1	59-7	59-4	59-1	58-6	58-4	58-1	57-6	57-3
68-7	63-0	62-5	62-3	62-0	61-5	61-2	61-0	60-5	60-2	59-7	59-5	59-2	58-7	58-4	58-2	57-7	57-4

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
68-0	56-4	56-1	55-6	55-3	55-1	54-6	54-3	54-0	53-6	53-3	53-0	52-6	52-3	52-0	51-5	51-3	51-0
68-1	56-4	56-2	55-7	55-4	55-1	54-7	54-4	54-1	53-7	53-4	53-1	52-6	52-4	52-1	51-6	51-3	51-1
68-2	56-5	56-2	56-0	55-5	55-2	55-0	54-5	54-2	53-7	53-5	53-2	52-7	52-4	52-2	51-7	51-4	51-2
68-3	56-6	56-3	56-1	55-6	55-3	55-0	54-6	54-3	54-0	53-5	53-3	53-0	52-5	52-2	52-0	51-5	51-2
68-4	56-7	56-4	56-1	55-7	55-4	55-1	54-6	54-4	54-1	53-6	53-3	53-1	52-6	52-3	52-0	51-6	51-3
68-5	57-0	56-5	56-2	55-7	55-5	55-2	54-7	54-5	54-2	53-7	53-4	53-1	52-7	52-4	52-1	51-6	51-4
68-6	57-1	56-6	56-3	56-0	55-6	55-3	55-0	54-5	54-3	54-0	53-5	53-2	53-0	52-5	52-2	51-7	51-5
68-7	57-1	56-7	56-4	56-1	55-6	55-4	55-1	54-6	54-3	54-1	53-6	53-3	53-0	52-6	52-3	52-0	51-5

69 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
69-0	68-5	68-2	68-0	67-5	67-2	66-7	66-5	66-2	65-7	65-4	65-2	64-7	64-4	64-1	63-6	63-4
69-1	68-6	68-3	68-1	67-6	67-3	67-0	66-6	66-3	66-0	65-5	65-3	65-0	64-5	64-2	64-0	63-5
69-2	68-7	68-4	68-2	67-7	67-4	67-1	66-7	66-4	66-1	65-6	65-4	65-1	64-6	46-3	64-0	63-6
69-3	69-0	68-5	68-3	68-0	67-5	67-2	67-0	66-5	66-2	65-7	65-5	65-2	64-7	64-4	64-1	63-7
69-4	69-1	68-6	68-4	68-1	67-6	67-3	67-0	66-6	66-3	66-0	65-5	65-3	65-0	64-5	64-2	64-0
69-5	69-2	68-7	68-5	68-2	67-7	67-4	67-1	66-7	66-4	66-1	65-6	65-4	65-1	64-6	64-3	64-0
69-6	69-3	69-0	68-6	68-3	68-0	67-5	67-2	67-0	66-5	66-2	65-7	65-5	65-2	64-7	64-4	64-1
69-7	69-4	69-1	68-7	68-4	68-1	67-6	67-3	67-1	66-6	66-3	66-0	65-5	65-3	65-0	64-5	64-2

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
69-0	63-1	62-6	62-3	62-0	61-6	61-3	61-0	60-6	60-3	60-0	59-5	59-2	58-7	58-5	58-2	58-0	57-5
69-1	63-2	62-7	62-4	62-2	61-7	61-4	61-1	60-7	60-4	60-1	59-6	59-3	59-0	58-6	58-3	58-1	57-6
69-2	63-3	63-0	62-5	62-3	62-0	61-5	61-2	61-0	60-5	60-2	59-7	59-4	59-1	58-7	58-4	58-1	57-7
69-3	63-4	63-1	62-6	62-4	62-1	61-6	61-3	61-0	60-6	60-3	60-0	59-5	59-2	59-0	58-5	58-2	57-7
69-4	63-5	63-2	62-7	62-4	62-2	61-7	61-4	61-1	60-7	60-4	60-1	59-6	59-3	59-1	58-6	58-3	58-0
69-5	63-6	63-3	63-0	62-5	62-3	62-0	61-5	61-2	60-7	60-5	60-2	59-7	59-4	59-1	58-7	58-4	58-1
69-6	63-7	63-4	63-1	62-6	62-3	62-1	61-6	61-3	61-0	60-5	60-3	60-0	59-5	59-2	59-0	58-5	58-2
69-7	63-7	63-5	63-2	62-7	62-4	62-2	61-7	61-4	61-1	60-6	60-4	60-1	59-6	59-3	59-0	58-6	58-3

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
69-0	57-2	56-7	56-5	56-2	55-7	55-4	55-2	54-7	54-4	54-1	53-7	53-4	53-1	52-6	52-4	52-1	51-6
69-1	57-3	57-0	56-5	56-3	56-0	55-5	55-2	55-0	54-5	54-2	53-7	53-5	53-2	52-7	52-4	52-2	51-7
69-2	57-4	57-1	56-6	56-4	56-1	55-6	55-3	55-0	54-6	54-3	54-0	53-5	53-3	53-0	52-5	52-2	52-0
69-3	57-5	57-2	56-7	56-4	56-2	55-7	55-4	55-1	54-6	54-4	54-1	53-6	53-3	53-1	52-6	52-3	52-0
69-4	57-5	57-3	57-0	56-5	56-2	56-0	55-5	55-2	54-7	54-4	54-2	53-7	53-4	53-1	52-7	52-4	52-1
69-5	57-6	57-4	57-1	56-6	56-3	56-0	55-6	55-3	55-0	54-5	54-2	54-0	53-5	53-2	52-7	52-5	52-2
69-6	57-7	57-4	57-2	56-7	56-4	56-1	55-6	55-4	55-1	54-6	54-3	54-0	53-6	53-3	53-0	52-5	52-3
69-7	58-0	57-5	57-2	57-0	56-5	56-2	55-7	55-4	55-2	54-7	54-4	54-1	53-6	53-4	53-1	52-6	52-3

70 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
70-0	69-5	69-2	69-0	68-5	68-2	67-7	67-4	67-2	66-7	66-4	66-1	65-6	65-4	65-1	64-6	64-3
70-1	69-6	69-3	69-1	68-6	68-3	68-0	67-5	67-3	67-0	66-5	66-2	65-7	65-5	65-2	64-7	64-4
70-2	69-7	69-4	69-2	68-7	68-4	68-1	67-6	67-4	67-1	66-6	66-3	66-0	65-5	65-3	65-0	64-5
70-3	70-0	69-5	69-3	69-0	68-5	68-2	67-7	67-5	67-2	66-7	66-4	66-1	65-6	65-4	65-1	64-6
70-4	70-1	69-6	69-4	69-1	68-6	68-3	68-0	67-6	67-3	67-0	66-5	66-2	65-7	65-5	65-2	64-7
70-5	70-2	69-7	69-5	69-2	68-7	68-4	68-1	67-6	67-4	67-1	66-6	66-3	66-0	65-6	65-3	65-0
70-6	70-3	70-0	69-6	69-3	69-0	68-5	68-2	67-7	67-5	67-2	66-7	66-4	66-1	65-6	65-4	65-1
70-7	70-4	70-1	69-6	69-4	69-1	68-6	68-3	68-0	67-6	67-3	67-0	66-5	66-2	65-7	65-4	65-2

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
70-0	64-0	63-6	63-3	63-0	62-5	62-2	62-0	61-5	61-2	60-7	60-4	60-2	59-7	59-4	59-1	58-6	58-4
70-1	64-1	63-7	63-4	63-1	62-6	62-3	62-0	61-6	61-3	61-0	60-5	60-2	60-0	59-5	59-2	58-7	58-4
70-2	64-2	63-7	63-5	63-2	62-7	62-4	62-1	61-7	61-4	61-1	60-6	60-3	60-1	59-6	59-3	59-0	58-5
70-3	64-3	64-0	63-6	63-3	63-0	62-5	62-2	61-7	61-5	61-2	60-7	60-4	60-1	59-7	59-4	59-1	58-6
70-4	64-4	64-1	63-6	63-4	63-1	62-6	62-3	62-0	61-6	61-3	61-0	60-5	60-2	59-7	59-5	59-2	58-7
70-5	64-5	64-2	63-7	63-5	63-2	62-7	62-4	62-1	61-6	61-4	61-1	60-6	60-3	60-0	59-5	59-3	59-0
70-6	64-6	64-3	64-0	63-5	63-3	63-0	62-5	62-2	61-7	61-4	61-2	60-7	60-4	60-1	59-6	59-3	59-1
70-7	64-7	64-4	64-1	63-6	63-3	63-1	62-6	62-3	62-0	61-5	61-2	61-0	60-5	60-2	59-7	59-4	59-1

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
70-0	58-1	57-6	57-3	57-0	56-6	56-3	56-0	55-5	55-2	55-0	54-5	54-2	53-7	53-4	53-2	52-7	52-4
70-1	58-2	57-7	57-4	57-1	56-6	56-4	56-1	55-6	55-3	55-0	54-6	54-3	54-0	53-5	53-2	53-0	52-5
70-2	58-2	58-0	57-5	57-2	56-7	56-4	56-2	55-7	55-4	55-1	54-6	54-4	54-1	53-6	53-3	53-0	52-6
70-3	58-3	58-0	57-6	57-3	57-0	56-5	56-2	56-0	55-5	55-2	54-7	54-4	54-2	53-7	53-4	53-1	52-6
70-4	58-4	58-1	57-6	57-4	57-1	56-6	56-3	56-0	55-6	55-3	55-0	54-5	54-2	53-7	53-5	53-2	52-7
70-5	58-5	58-2	57-7	57-4	57-2	56-7	56-4	56-1	55-6	55-4	55-1	54-6	54-3	54-0	53-5	53-3	53-0
70-6	58-6	58-3	58-0	57-5	57-2	57-0	56-5	56-2	55-7	55-4	55-1	54-7	54-4	54-1	53-6	53-3	53-1
70-7	58-7	58-4	58-1	57-6	57-3	57-0	56-6	56-3	56-0	55-5	55-2	54-7	54-5	54-2	53-7	53-4	53-1

71 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
71-0	70-5	70-2	69-7	69-5	69-2	68-7	68-4	68-1	67-6	67-4	67-1	66-6	66-3	66-0	65-5	65-3
71-1	70-6	70-3	70-0	69-6	69-3	69-0	68-5	68-2	67-7	67-5	67-2	66-7	66-4	66-1	65-6	65-3
71-2	70-7	70-4	70-1	69-7	69-4	69-1	68-6	68-3	68-0	67-6	67-3	67-0	66-5	66-2	65-7	65-4
71-3	71-0	70-5	70-2	70-0	69-5	69-2	68-7	68-4	68-1	67-7	67-4	67-1	66-6	66-3	66-0	65-5
71-4	71-1	70-6	70-3	70-1	69-6	69-3	69-0	68-5	68-2	67-7	67-4	67-2	66-7	66-4	66-1	65-6
71-5	71-2	70-7	70-4	70-2	69-7	69-4	69-1	68-6	68-3	68-0	67-5	67-3	67-0	66-5	66-2	65-7
71-6	71-3	71-0	70-5	70-3	70-0	69-5	69-2	68-7	68-4	68-1	67-6	67-4	67-1	66-6	66-3	66-0
71-7	71-4	71-1	70-6	70-4	70-1	69-6	69-3	69-0	68-5	68-2	67-7	67-4	67-2	66-7	66-4	66-1

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
71-0	65-0	64-5	64-2	63-7	63-4	63-2	62-7	62-4	62-1	61-6	61-3	61-0	60-6	60-3	60-0	59-5	59-2
71-1	65-1	64-6	64-3	64-0	63-5	63-2	63-0	62-5	62-2	61-7	61-4	61-1	60-6	60-4	60-1	59-6	59-3
71-2	65-2	64-7	64-4	64-1	63-6	63-3	63-0	62-6	62-3	62-0	61-5	61-2	60-7	60-5	60-2	59-7	59-4
71-3	65-2	65-0	64-5	64-2	63-7	63-4	63-1	62-6	62-4	62-1	61-6	61-3	61-0	60-5	60-2	60-0	59-5
71-4	65-3	65-1	64-6	64-3	64-0	63-5	63-2	62-7	62-5	62-2	61-7	61-4	61-1	60-6	60-3	60-0	59-6
71-5	65-4	65-1	64-7	64-4	64-1	63-6	63-3	63-0	62-5	62-3	62-0	61-5	61-2	60-7	60-4	60-1	59-6
71-6	65-5	65-2	64-7	64-5	64-2	63-7	63-4	63-1	62-6	62-3	62-1	61-6	61-3	61-0	60-5	60-2	59-7
71-7	65-6	65-3	65-0	64-6	64-3	64-0	63-5	63-2	62-7	62-4	62-1	61-7	61-4	61-1	60-6	60-3	60-0

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
71-0	58-7	58-5	58-2	57-7	57-4	57-1	56-6	56-4	56-1	55-6	55-3	55-0	54-5	54-3	54-0	53-5	53-2
71-1	59-0	58-5	58-3	58-0	57-5	57-2	56-7	56-4	56-2	55-7	55-4	55-1	54-6	54-3	54-0	53-6	53-3
71-2	59-1	58-6	58-3	58-1	57-6	57-3	57-0	56-5	56-2	55-7	55-5	55-2	54-7	54-4	54-1	53-6	53-4
71-3	59-2	58-7	58-4	58-1	57-7	57-4	57-1	56-6	56-3	56-0	55-5	55-3	55-0	54-5	54-2	53-7	53-4
71-4	59-3	59-0	58-5	58-2	57-7	57-4	57-2	56-7	56-4	56-1	55-6	55-4	55-0	54-6	54-3	54-0	53-5
71-5	59-4	59-1	58-6	58-3	58-0	57-5	57-2	57-0	56-5	56-2	55-7	55-4	55-1	54-6	54-3	54-1	53-6
71-6	59-4	59-2	58-7	58-4	58-1	57-6	57-3	57-0	56-5	56-3	56-0	55-5	55-2	54-7	54-4	54-1	53-7
71-7	59-5	59-2	59-0	58-5	58-2	57-7	57-4	57-1	56-6	56-3	56-1	55-6	55-3	55-0	54-5	54-2	53 7

72 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
72-0	71-5	71-2	70-7	70-4	70-2	69-7	69-4	69-1	68-6	68-3	68-0	67-5	67-3	67-0	66-5	66-2
72-1	71-6	71-3	71-0	70-5	70-3	70-0	69-5	69-2	68-7	68-4	68-1	67-6	67-4	67-1	66-6	66-3
72-2	71-7	71-4	71-1	70-6	70-4	70-1	69-6	69-3	69-0	68-5	68-2	67-7	67-4	67-2	66-7	66-4
72-3	72-0	71-5	71-2	70-7	70-5	70-2	69-7	69-4	69-1	68-6	68-3	68-0	67-5	67-2	67-0	66-5
72-4	72-1	71-6	71-3	71-0	70-5	70-3	70-0	69-5	69-2	68-7	68-4	68-1	67-6	67-3	67-1	66-6
72-5	72-2	71-7	71-4	71-1	70-6	70-4	70-1	69-6	69-3	69-0	68-5	68-2	67-7	67-4	67-1	66-7
72-6	72-3	72-0	71-5	71-2	70-7	70-5	70-2	69-7	69-4	69-1	68-6	68-3	68-0	67-5	67-2	66-7
72-7	72-4	72-1	71-6	71-3	71-0	70-6	70-3	70-0	69-5	69-2	68-7	68-4	68-1	67-6	67-3	67-0

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
72-0	65-7	65-4	65-1	64-6	64-4	64-1	63-6	63-3	63-0	62-5	62-2	61-7	61-4	61-2	60-7	60-4	60-1
72-1	66-0	65-5	65-2	64-7	64-4	64-2	63-7	63-4	63-1	62-6	62-3	62-0	61-5	61-2	61-0	60-5	60-2
72-2	66-1	65-6	65-3	65-0	64-5	64-2	64-0	63-5	63-2	62-7	62-4	62-1	61-6	61-3	61-0	60-6	60-3
72-3	66-2	65-7	65-4	65-1	64-6	64-3	64-0	63-6	63-3	63-0	62-5	62-2	61-7	61-4	61-1	60-6	60-3
72-4	66-3	66-0	65-5	65-2	64-7	64-4	64-1	63-6	63-4	63-1	62-6	62-3	62-0	61-5	61-2	60-7	60-4
72-5	66-4	66-1	65-6	65-3	65-0	64-5	64-2	63-7	63-4	63-2	62-7	62-4	62-1	61-6	61-3	61-0	60-5
72-6	66-5	66-2	65-7	65-4	65-1	64-6	64-3	64-0	63-5	63-2	62-7	62-5	62-2	61-7	61-4	61-1	60-6
72-7	66-5	66-3	66-0	65-5	65-2	64-7	64-4	64-1	63-6	63-3	63-0	62-5	62-3	62-0	61-5	61-2	60-7

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
72-0	59-6	59-3	59-0	58-5	58-3	58-0	57-5	57-2	56-7	56-4	56-1	55-6	55-4	55-1	54-6	54-3	54-0
72-1	59-7	59-4	59-1	58-6	58-3	58-0	57-6	57-3	57-0	56-5	56-2	55-7	55-4	55-1	54-7	54-4	54-1
72-2	60-0	59-5	59-2	58-7	58-4	58-1	57-6	57-4	57-1	56-6	56-3	56-0	55-5	55-2	54-7	54-4	54-2
72-3	60-1	59-6	59-3	59-0	58-5	58-2	57-7	57-4	57-1	56-7	56-4	56-1	55-6	55-3	55-0	54-5	54-2
72-4	60-1	59-7	59-4	59-1	58-6	58-3	58-0	57-5	57-2	56-7	56-4	56-2	55-7	55-4	55-1	54-6	54-3
72-5	60-2	59-7	59-4	59-2	58-7	58-4	58-1	57-6	57-3	57-0	56-5	56-2	55-7	55-4	55-2	54-7	54-4
72-6	60-3	60-0	59-5	59-2	58-7	58-5	58-2	57-7	57-4	57-1	56-6	56-3	56-0	55-5	55-2	54-7	54-5
72-7	60-4	60-1	59-6	59-3	59-0	58-5	58-3	57-7	57-5	57-2	56-7	56-4	56-1	55-6	55-3	55-0	54-5

73 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
73-0	72-5	72-2	71-7	71-4	71-1	70-6	70-4	70-1	69-6	69-3	69-0	68-5	68-2	67-7	67-4	67-1
73-1	72-6	72-3	72-0	71-5	71-2	70-7	70-5	70-2	69-7	69-4	69-1	68-6	68-3	68-0	67-5	67-2
73-2	72-7	72-4	72-1	71-6	71-3	71-0	70-5	70-3	70-0	69-5	69-2	68-7	68-4	68-1	67-6	67-3
73-3	73-0	72-5	72-2	71-7	71-4	71-1	70-6	70-4	70-1	69-6	69-3	69-0	68-5	68-2	67-7	67-4
73-4	73-1	72-6	72-3	72-0	71-5	71-2	70-7	70-4	70-2	69-7	69-4	69-1	68-6	68-3	68-0	67-5
73-5	73-2	72-7	72-4	72-1	71-6	71-3	71-0	70-5	70-3	70-0	69-5	69-2	68-7	68-4	68-1	67-6
73-6	73-3	73-0	72-5	72-2	71-7	71-4	71-1	70-6	70-3	70-1	69-6	69-3	69-0	68-5	68-2	67-7
73-7	73-4	73-1	72-6	72-3	72-0	71-5	71-2	70-7	70-4	70-1	69-7	69-4	69-1	68-6	68-3	68-0

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
73-0	66-6	66-3	66-1	65-6	65-3	65-0	64-5	64-2	63-7	63-4	63-1	62-6	62-3	62-0	61-5	61-3	61-0
73-1	66-7	66-4	66-1	65-7	65-4	65-1	64-6	64-3	64-0	63-5	63-2	62-7	62-4	62-1	61-6	61-3	61-0
73-2	67-0	66-5	66-2	65-7	65-4	65-2	64-7	64-4	64-1	63-6	63-3	63-0	62-5	62-2	61-7	61-4	61-1
73-3	67-1	66-6	66-3	66-0	65-5	65-2	65-0	64-5	64-2	63-7	63-4	63-1	62-6	62-3	62-0	61-5	61-2
73-4	67-2	66-7	66-4	66-1	65-6	65-3	65-0	61-6	64-3	64-0	63-5	63-2	62-7	62-4	62-1	61-6	61-3
73-5	67-3	67-0	66-5	66-2	65-7	65-4	65-1	64-6	64-3	64-0	63-5	63-3	63-0	62-5	62-2	61-7	61-4
73-6	67-4	67-1	66-6	66-3	66-0	65-5	65-2	64-7	64-4	64-1	63-6	63-3	63-0	62-6	62-3	62-0	61-5
73-7	67-5	67-2	66-7	66-4	66-1	65-6	65-3	65-0	64-5	64-2	63-7	63-4	63-1	62-6	62-3	62-0	61-5

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
73-0	60-5	60-2	59-7	59-4	59-1	58-6	58-3	58-0	57-5	57-2	57-0	56-5	56-2	55-7	55-4	55-1	54-6
73-1	60-6	60-3	60-0	59-5	59-2	58-7	58-4	58-1	57-6	57-3	57-0	56-5	56-2	56-0	55-5	55-2	54-7
73-2	60-6	60-3	60-1	59-6	59-3	59-0	58-5	58-2	57-7	57-4	57-1	56-6	56-3	56-0	55-5	55-2	55-0
73-3	60-7	60-4	60-1	59-6	59-3	59-1	58-6	58-3	58-0	57-5	57-2	56-7	56-4	56-1	55-6	55-3	55-0
73-4	61-0	60-5	60-2	59-7	59-4	59-1	58-6	58-3	58-1	57-6	57-3	57-0	56-5	56-2	55-7	55-4	55-1
73-5	61-1	60-6	60-3	60-0	59-5	59-2	58-7	58-4	58-1	57-6	57-3	57-0	56-6	56-3	56-0	55-5	55-2
73-6	61-2	60-7	60-4	60-1	59-6	59-3	59-0	58-5	58-2	57-7	57-4	57-1	56-6	56-3	56-0	55-5	55-3
73-7	61-3	61-0	60-5	60-2	59-7	59-4	59-1	58-6	58-3	58-0	57-5	57-2	56-7	56-4	56-1	55-6	55-3

74 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
74-0	73-5	73-2	72-7	72-4	72-1	71-6	71-3	71-0	70-5	70-2	69-7	69-4	69-2	68-7	68-4	68-1
74-1	73-6	73-3	73-0	72-5	72-2	71-7	71-4	71-1	70-6	70-3	70-0	69-5	69-2	68-7	68-5	68-2
74-2	73-7	73-4	73-1	72-6	72-3	72-0	71-5	71-2	70-7	70-4	70-1	69-6	69-3	69-0	68-5	68-2
74-3	74-0	73-5	73-2	72-7	72-4	72-1	71-6	71-3	71-0	70-5	70-2	69-7	69-4	69-1	68-6	68-3
74-4	74-1	73-6	73-3	73-0	72-5	72-2	71-7	71-4	71-1	70-6	70-3	70-0	69-5	69-2	68-7	68-4
74-5	74-2	73-7	73-4	73-1	72-6	72-3	72-0	71-5	71-2	70-7	70-4	70-1	69-6	69-3	69-0	68-5
74-6	74-3	74-0	73-5	73-2	72-7	72-4	72-1	71-6	71-3	71-0	70-5	70-2	69-7	69-4	69-1	68-6
74-7	74-4	74-1	73-6	73-3	73-0	72-5	72-2	71-7	71-4	71-1	70-6	70-3	70-0	69-5	69-2	68-7

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
74-0	67-6	67-3	67-0	66-5	66-2	65-7	65-4	65-1	64-6	64-3	64-0	63-5	63-2	62-7	62-4	62-1	61-6
74-1	67-7	67-4	67-1	66-6	66-3	66-0	65-5	65-2	64-7	64-4	64-1	63-6	63-3	63-0	62-5	62-2	61-7
74-2	68-0	67-5	67-2	66-7	66-4	66-1	65-6	65-3	65-0	64-5	64-2	63-7	63-4	63-1	62-6	62-3	62-0
74-3	68-0	67-5	67-2	67-0	66-5	66-2	65-7	65-4	65-1	64-6	64-3	64-0	63-5	63-2	62-7	62-4	62-1
74-4	68-1	67-6	67-3	67-0	66-5	66-2	65-7	65-4	65-2	64-7	64-4	64-1	63-6	63-3	63-0	62-5	62-2
74-5	68-2	67-7	67-4	67-1	66-6	66-3	66-0	65-5	65-2	64-7	64-4	64-1	63-6	63-3	63-0	62-5	62-2
74-6	68-3	68-0	67-5	67-2	66-7	66-4	66-1	65-6	65-3	65-0	64-5	64-2	63-7	63-4	63-1	62-6	62-3
74-7	68-4	68-1	67-6	67-3	67-0	66-5	66-2	65-7	65-4	65-1	64-6	64-3	64-0	63-5	63-2	62-7	62-4

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
74-0	61-3	61-0	60-5	60-2	60-0	59-5	59-2	58-7	58-4	58-1	57-6	57-3	57-0	56-5	56-2	55-7	55-4
74-1	61-4	61-1	60-6	60-3	60-0	59-5	59-2	59-0	58-4	58-2	57-7	57-4	57-1	56-6	56-3	56-0	55-5
74-2	61-5	61-2	60-7	60-4	60-1	59-6	59-3	59-0	58-5	58-2	57-7	57-4	57-1	56-6	56-3	56-0	55-6
74-3	61-6	61-3	61-0	60-5	60-2	59-7	59-4	59-1	58-6	58-3	58-0	57-5	57-2	56-7	56-4	56-1	55-6
74-4	61-7	61-4	61-1	60-6	60-3	60-0	59-5	59-2	58-7	58-4	58-1	57-6	57-3	57-0	56-5	56-2	55-7
74-5	62-0	61-5	61-2	60-7	60-4	60-1	59-6	59-3	59-0	58-5	58-2	57-7	57-4	57-1	56-6	56-3	56-0
74-6	62-0	61-5	61-2	60-7	60-4	60-1	59-6	59-3	59-0	58-5	58-2	57-7	57-4	57-1	56-6	56-3	56-1
74-7	62-1	61-6	61-3	61-0	60-5	60-2	59-7	59-4	59-1	58-6	58-3	58-0	57-5	57-2	56-7	56-4	56-1

75 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
75-0	74-5	74-2	73-7	73-4	73-1	72-6	72-3	72-0	71-5	71-2	70-7	70-4	70-1	69-6	69-3	69-0
75-1	74-6	74-3	74-0	73-5	73-2	72-7	72-4	72-1	71-6	71-3	71-0	70-5	70-2	69-7	69-4	69-1
75-2	74-7	74-4	74-1	73-6	73-3	73-0	72-5	72-2	71-7	71-4	71-1	70-6	70-3	70-0	69-5	69-2
75-3	75-0	74-5	74-2	73-7	73-4	73-1	72-6	72-3	72-0	71-5	71-2	70-7	70-4	70-1	69-6	69-3
75-4	75-1	74-6	74-3	74-0	74-5	73-2	72-7	72-4	72-1	71-6	71-3	71-0	70-5	70-2	69-7	69-4
75-5	75-2	74-7	74-4	74-1	73-6	73-3	73-0	72-5	72-2	71-7	71-4	71-1	70-6	70-3	70-0	69-5
75-6	75-3	75-0	74-5	74-2	73-7	73-4	73-1	72-6	72-3	72-0	71-5	71-2	70-7	70-4	70-1	69-6
75-7	75-4	75-1	74-6	74-3	74-0	73-5	73-2	72-7	72-4	72-1	71-6	71-3	71-0	70-5	70-2	69-6

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
75-0	68-5	68-2	67-7	67-4	67-1	66-6	66-3	66-0	65-5	65-2	64-7	64-4	64-1	63-6	63-3	63-0	62-5
75-1	68-6	68-3	68-0	67-5	67-2	66-7	66-4	66-1	65-6	65-3	65-0	64-5	64-2	63-7	63-4	63-1	62-6
75-2	68-7	68-4	68-1	67-6	67-3	67-0	66-5	66-2	65-7	65-4	65-1	64-6	64-3	64-0	63-5	63-2	62-7
75-3	69-0	68-5	68-2	67-7	67-4	67-1	66-6	66-3	66-0	65-5	65-2	64-7	64-4	64-1	63-6	63-3	63-0
75-4	69-1	68-6	68-3	68-0	67-5	67-2	66-7	66-4	66-1	65-6	65-3	64-7	64-4	64-1	63-6	63-3	63-0
75-5	69-2	68-7	68-4	68-1	67-6	67-2	66-7	66-4	66-1	65-6	65-3	65-0	64-5	64-2	63-7	63-4	63-1
75-6	69-3	68-7	68-4	68-1	67-6	67-3	67-0	66-5	66-2	65-7	65-4	65-1	64-6	64-3	64-0	63-5	63-2
75-7	69-3	69-0	68-5	68-2	67-7	67-4	67-1	66-6	66-3	66-0	65-5	65-2	64-7	64-4	64-1	63-6	63-3

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
75-0	62-2	61-7	61-4	61-1	60-6	60-3	60-0	59-5	59-2	58-7	58-4	58-1	57-6	57-3	57-0	56-5	56-2
75-1	62-3	62-0	61-5	61-2	60-7	60-4	60-1	59-6	59-3	59-0	58-5	58-2	57-7	57-4	57-1	56-6	56-3
75-2	62-4	62-1	61-6	61-3	61-0	60-5	60-2	59-7	59-4	59-1	58-6	58-3	58-0	57-5	57-2	56-7	56-4
75-3	62-4	62-1	61-6	61-3	61-0	60-5	60-2	59-7	59-4	59-1	58-6	58-3	58-0	57-5	57-2	56-7	56-4
75-4	62-5	62-2	61-7	61-4	61-1	60-6	60-3	60-0	59-5	59-2	58-7	58-4	58-1	57-6	57-3	57-0	56-5
75-5	62-6	62-3	62-0	61-5	61-2	60-7	60-4	60-1	59-6	59-3	59-0	58-5	58-2	57-7	57-4	57-1	56-6
75-6	62-7	62-4	62-1	61-6	61-3	61-0	60-5	60-2	59-7	59-4	59-1	58-6	58-3	58-0	57-5	57-2	56-7
75-7	63-0	62-5	62-2	61-7	61-4	61-1	60-6	60-3	60-0	59-4	59-1	58-6	58-3	58-0	57-5	57-2	56-7

76 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
76-0	75-5	75-2	74-7	74-4	74-1	73-6	73-3	73-0	72-5	72-2	71-7	71-4	71-0	70-5	70-2	69-7
76-1	75-6	75-3	75-0	74-5	74-2	73-7	73-4	73-1	72-6	72-3	72-0	71-4	71-1	70-6	70-3	70-0
76-2	75-7	75-4	75-1	74-6	74-3	74-0	73-5	73-2	72-7	72-4	72-0	71-5	71-2	70-7	70-4	70-1
76-3	76-0	75-5	75-2	74-7	74-4	74-1	73-6	73-3	73-0	72-4	72-1	71-6	71-3	71-0	70-5	70-2
76-4	76-1	75-6	75-3	75-0	74-5	74-2	73-7	73-4	73-0	72-5	72-2	71-7	71-4	71-1	70-6	70-3
76-5	76-2	75-7	75-4	75-1	74-6	74-3	74-0	73-4	73-1	72-6	72-3	72-0	71-5	71-2	70-7	70-4
76-6	75-3	76-0	75-5	75-2	74-7	74-4	74-1	73-5	73-2	72-7	72-4	72-1	71-6	71-3	71-0	70-5
76-7	76-4	76-1	75-6	75-3	75-0	74-5	74-2	73-6	73-3	73-0	72-5	72-2	71-7	71-4	71-1	70-6

Yd	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
76-0	69-4	69-1	68-6	68-3	68-0	67-5	67-2	66-7	66-4	66-1	65-6	65-3	65-0	64-5	64-2	63-7	63-4
76-1	69-5	69-2	68-7	68-4	68-1	67-6	67-3	67-0	66-5	66-2	65-7	65-4	65-1	64-6	64-3	64-0	63-5
76-2	69-6	69-3	69-0	68-5	68-2	67-7	67-4	67-1	66-6	66-3	66-0	65-5	65-2	64-7	64-3	64-0	63-5
76-3	69-7	69-4	69-1	68-6	68-3	68-0	67-5	67-2	66-7	66-4	66-1	65-5	65-2	64-7	64-4	64-1	63-6
76-4	70-0	69-5	69-2	68-7	68-4	68-1	67-6	67-3	67-0	66-4	66-1	65-6	65-3	65-0	64-5	64-2	63-7
76-5	70-1	69-6	69-3	69-0	68-5	68-2	67-7	67-3	67-0	66-5	66-2	65-7	65-4	65-1	64-6	64-3	64-0
76-6	70-2	69-7	69-4	69-1	68-6	68-2	67-7	67-4	67-1	66-6	66-3	66-0	65-5	65-2	64-7	64-4	64-1
76-7	70-3	70-0	69-5	69-2	68-6	68-3	68-0	67-5	67-2	66-7	66-4	66-1	65-6	65-3	65-0	64-5	64-2

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
76-0	63-1	62-6	62-3	62-0	61-4	61-1	60-6	60-3	60-0	59-5	59-2	58-7	58-4	58-1	57-6	57-3	57-0
76-1	63-1	62-6	62-3	62-0	61-5	61-2	60-7	60-4	60-1	59-6	59-3	59-0	58-5	58-2	57-7	57-4	57-1
76-2	63-2	62-7	62-4	62-1	61-6	61-3	61-0	60-5	60-2	59-7	59-4	59-1	58-6	58-3	58-0	57-5	57-2
76-3	63-3	63-0	62-5	62-2	61-7	61-4	61-1	60-6	60-3	60-0	59-5	59-2	58-6	58-3	58-0	57-5	57-2
76-4	63-4	63-1	62-6	62-3	62-0	61-5	61-2	60-7	60-3	60-0	59-5	59-2	58-7	58-4	58-1	57-6	57-3
76-5	63-5	63-2	62-7	62-4	62-1	61-5	61-2	60-7	60-4	60-1	59-6	59-3	59-0	58-5	58-2	57-7	57-4
76-6	63-6	63-3	62-7	62-4	62-1	61-6	61-3	61-0	60-5	60-2	59-7	59-4	59-1	58-6	58-3	58-0	57-5
76-7	63-6	63-3	63-0	62-5	62-2	61-7	61-4	61-1	60-6	60-3	60-0	59-5	59-2	58-6	58-3	58-0	57-5

77 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
77-0	76-5	76-2	75-7	75-4	75-1	74-6	74-2	73-7	73-4	73-1	72-6	72-3	72-0	71-5	71-2	70-7
77-1	76-6	76-3	76-0	75-5	75-2	74-6	74-3	74-0	73-5	73-2	72-7	72-4	72-1	71-6	71-3	71-0
77-2	76-7	76-4	76-1	75-6	75-3	74-7	74-4	74-1	73-6	73-3	73-0	72-5	72-2	71-7	71-4	71-1
77-3	77-0	76-5	76-2	75-7	75-4	75-0	74-5	74-2	73-7	73-4	73-1	72-6	72-3	72-0	71-5	71-2
77-4	77-1	76-6	76-3	76-0	75-5	75-1	74-6	74-3	74-0	73-5	73-2	72-7	72-4	72-1	71-6	71-2
77-5	77-2	76-7	76-4	76-1	75-6	75-2	74-7	74-4	74-1	73-6	73-3	73-0	72-5	72-2	71-6	71-3
77-6	77-3	77-0	76-5	76-2	75-6	75-3	75-0	74-5	74-2	73-7	73-4	73-1	72-6	72-2	71-7	71-4
77-7	77-4	77-1	76-6	76-3	75-7	75-4	75-1	74-6	74-3	74-0	73-5	73-2	72-7	72-3	72-0	71-5

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
77-0	70-4	70-1	69-6	69-2	68-7	68-4	68-1	67-6	67-3	67-0	66-5	66-2	65-7	65-4	65-1	64-5	64-2
77-1	70-5	70-1	69-6	69-3	69-0	68-5	68-2	67-7	67-4	67-1	66-6	66-3	66-0	65-4	65-1	64-6	64-3
77-2	70-5	70-2	69-7	69-4	69-1	68-6	68-3	68-0	67-5	67-2	66-7	66-3	66-0	65-5	65-2	64-7	64-4
77-3	70-6	70-3	70-0	69-5	69-2	68-7	68-4	68-1	67-6	67-3	66-7	66-4	66-1	65-6	65-3	65-0	64-5
77-4	70-7	70-4	70-1	69-6	69-3	69-0	68-5	68-2	67-7	67-3	67-0	66-5	66-2	65-7	65-4	65-1	64-6
77-5	71-0	70-5	70-2	69-7	69-4	69-1	68-6	68-2	67-7	67-4	67-1	66-6	66-3	66-0	65-5	65-2	64-7
77-6	71-1	70-6	70-3	70-0	69-5	69-2	68-6	68-3	68-0	67-5	67-2	66-7	66-4	66-1	65-6	65-2	64-7
77-7	71-2	70-7	70-4	70-1	69-6	69-2	68-7	68-4	68-1	67-6	67-3	67-0	66-5	66-2	65-6	65-3	65-0

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
77-0	63-7	63-4	63-1	62-6	62-3	62-0	61-5	61-2	60-7	60-4	60-0	59-5	59-2	58-7	58-4	58-1	57-6
77-1	64-0	63-5	63-2	62-7	62-4	62-1	61-6	61-3	60-7	60-4	60-1	59-6	59-3	59-0	58-5	58-2	57-7
77-2	64-1	63-6	63-3	63-0	62-5	62-1	61-6	61-3	61-0	60-5	60-2	59-7	59-4	59-1	58-6	58-3	58-0
77-3	64-2	63-7	63-4	63-0	62-5	62-2	61-7	61-4	61-1	60-6	60-3	60-0	59-5	59-2	58-6	58-3	58-0
77-4	64-3	64-0	63-4	63-1	62-6	62-3	62-0	61-5	61-2	60-7	60-4	60-1	59-5	59-2	58-7	58-4	58-1
77-5	64-3	64-0	63-5	63-2	62-7	62-4	62-1	61-6	61-3	60-7	60-4	60-1	59-6	59-3	59-0	58-5	58-2
77-6	64-4	64-1	63-6	63-3	63-0	62-5	62-2	61-6	61-3	61-0	60-5	60-2	59-7	59-4	59-1	58-6	58-3
77-7	64-5	64-2	63-7	63-4	63-1	62-6	62-2	61-7	61-4	61-1	60-6	60-3	60-0	59-5	59-1	58-6	58-3

78 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
78-0	77-5	77-2	76-7	76-4	76-0	75-5	75-2	74-7	74-4	74-1	73-6	73-3	72-7	72-4	72-1	71-6
78-1	77-6	77-3	77-0	76-5	76-1	75-6	75-3	75-0	74-5	74-2	73-7	73-4	73-0	72-5	72-2	71-7
78-2	77-7	77-4	77-1	76-5	76-2	75-7	75-4	75-1	74-6	74-3	74-0	73-4	73-1	72-6	72-3	72-0
78-3	78-0	77-5	77-2	76-6	76-3	76-0	75-5	75-2	74-7	74-4	74-1	73-5	73-2	72-7	72-4	72-1
78-4	78-1	77-6	77-3	76-7	76-4	76-1	75-6	75-3	75-0	74-5	74-2	73-6	73-3	73-0	72-5	72-2
78-5	78-2	77-7	77-4	77-0	76-5	76-2	75-7	75-4	75-1	74-6	74-2	73-7	73-4	73-1	72-6	72-3
78-6	78-3	78-0	77-5	77-1	76-6	76-3	76-0	75-5	75-2	74-7	74-3	74-0	73-5	73-2	72-7	72-4
78-7	78-4	78-1	77-6	77-2	76-7	76-4	76-1	76-6	75-3	74-7	74-4	74-1	73-6	73-3	73-0	72-5

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
78-0	71-3	71-0	70-5	70-2	69-6	69-3	69-0	68-5	68-2	67-7	67-4	67-1	66-6	66-2	65-7	65-4	65-1
78-1	71-4	71-1	70-6	70-3	69-7	69-4	69-1	68-6	68-3	68-0	67-5	67-2	66-6	66-3	66-0	65-5	65-2
78-2	71-5	71-2	70-7	70-3	70-0	69-5	69-2	68-7	68-4	68-1	67-5	67-2	66-7	66-4	66-1	65-6	65-3
78-3	71-6	71-3	70-7	70-4	70-1	69-6	69-3	69-0	68-5	68-2	67-6	67-3	67-0	66-5	66-2	65-7	65-4
78-4	71-7	71-3	71-0	70-5	70-2	69-7	69-4	69-1	68-6	68-2	67-7	67-4	67-1	66-6	66-3	66-0	65-4
78-5	72-0	71-4	71-1	70-6	70-3	70-0	69-5	69-2	68-6	68-3	68-0	67-5	67-2	66-7	66-4	66-0	65-5
78-6	72-0	71-5	71-2	70-7	70-4	70-1	69-6	69-2	68-7	68-4	68-1	67-6	67-3	67-0	66-4	66-1	65-6
78-7	72-1	71-6	71-3	71-0	70-5	70-2	69-6	69-3	69-0	68-5	68-2	67-7	67-4	67-0	66-5	66-2	65-7

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
78-0	64-6	64-3	64-0	63-5	63-1	62-6	62-3	62-0	61-5	61-2	60-7	60-4	60-0	59-5	59-2	58-7	58-4
78-1	64-7	64-4	64-1	63-5	63-2	62-7	62-4	62-1	61-6	61-3	61-0	60-4	60-1	59-6	59-3	59-0	58-5
78-2	65-0	64-4	64-1	63-6	63-3	63-0	62-5	62-2	61-7	61-3	61-0	60-5	60-2	59-7	59-4	59-1	58-6
78-3	65-0	64-5	64-2	63-7	63-4	63-1	62-6	62-2	61-7	61-4	61-1	60-6	60-3	60-0	59-5	59-1	58-6
78-4	65-1	64-6	64-3	64-0	63-5	63-2	62-6	62-3	62-0	61-5	61-2	60-7	60-4	60-0	59-5	59-2	58-7
78-5	65-2	64-7	64-4	64-1	63-5	63-2	62-7	62-4	62-1	61-6	61-3	60-7	60-4	60-1	59-6	59-3	59-0
78-6	65-3	65-0	64-5	64-1	63-6	63-3	63-0	62-5	62-2	61-7	61-3	61-0	60-5	60-2	59-7	59-4	59-1
78-7	65-4	65-1	64-5	64-2	63-7	63-4	63-1	62-6	62-2	61-7	61-4	61-1	60-6	60-3	60-0	59-4	59-1

79 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
79-0	78-5	78-2	77-7	77-3	77-0	76-5	76-2	75-7	75-4	75-0	74-5	74-2	73-7	73-4	73-1	72-5
79-1	78-6	78-3	78-0	77-4	77-1	76-6	76-3	76-0	75-5	75-1	74-6	74-3	74-0	73-5	73-2	72-6
79-2	78-7	78-4	78-0	77-5	77-2	76-7	76-4	76-1	75-5	75-2	74-7	74-4	74-1	73-6	73-2	72-7
79-3	79-0	78-5	78-1	77-6	77-3	77-0	76-5	76-2	75-6	75-3	75-0	74-5	74-2	73-7	73-3	73-0
79-4	79-1	78-6	78-2	77-7	77-4	77-1	76-6	76-3	75-7	75-4	75-1	74-6	74-3	73-7	73-4	73-1
79-5	79-2	78-7	78-3	78-0	77-5	77-2	76-7	76-4	76-0	75-5	75-2	74-7	74-4	74-0	73-5	73-2
79-6	79-3	79-0	78-4	78-1	77-6	77-3	77-0	76-4	76-1	75-6	75-3	75-0	74-5	74-1	73-6	73-3
79-7	79-4	79-1	78-5	78-2	77-7	77-4	77-1	76-5	76-2	75-7	75-4	75-1	74-6	74-2	73-7	73-4

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
79-0	72-2	71-7	71-4	71-1	70-6	70-2	69-7	69-4	69-1	68-6	68-3	68-0	67-4	67-1	66-6	66-3	66-0
79-1	72-3	72-0	71-5	71-2	70-7	70-3	70-0	69-5	69-2	68-7	68-4	68-0	67-5	67-2	66-7	66-4	66-1
79-2	72-4	72-1	71-6	71-3	70-7	70-4	70-1	69-6	69-3	69-0	68-4	68-1	67-6	67-3	67-0	66-5	66-1
79-3	72-5	72-2	71-7	71-4	71-0	70-5	70-2	69-7	69-4	69-0	68-5	68-2	67-7	67-4	67-1	66-5	66-2
79-4	72-6	72-3	72-0	71-4	71-1	70-6	70-3	70-0	69-5	69-1	68-6	68-3	68-0	67-5	67-1	66-6	66-3
79-5	72-7	72-4	72-0	71-5	71-2	70-7	70-4	70-1	69-5	69-2	68-7	68-4	68-1	67-6	67-2	66-7	66-4
79-6	73-0	72-5	72-1	71-6	71-3	71-0	70-5	70-1	69-6	69-3	69-0	68-5	68-1	67-6	67-3	67-0	66-5
79-7	73-1	72-5	72-2	71-7	71-4	71-1	70-6	70-2	69-7	69-4	69-1	68-6	68-2	67-7	67-4	67-1	66-6

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
79-0	65-5	65-1	64-6	64-3	64-0	63-5	63-2	62-6	62-3	62-0	61-5	61-2	60-7	60-3	60-0	59-5	59-2
79-1	65-5	65-2	64-7	64-4	64-1	63-6	63-2	62-7	62-4	62-1	61-6	61-3	60-7	60-4	60-1	59-6	59-3
79-2	65-6	65-3	65-0	64-5	64-2	63-6	63-3	63-0	62-5	62-2	61-7	61-3	61-0	60-5	60-2	59-7	59-4
79-3	65-7	65-4	65-1	64-6	64-2	63-7	63-4	63-1	62-6	62-2	61-7	61-4	61-1	60-6	60-3	59-7	59-4
79-4	66-0	65-5	65-2	64-6	64-3	64-0	63-5	63-2	62-6	62-3	62-0	61-5	61-2	60-7	60-3	60-0	59-5
79-5	66-1	65-6	65-2	64-7	64-4	64-1	63-6	63-2	62-7	62-4	62-1	61-6	61-2	60-7	60-4	60-1	59-6
79-6	66-2	65-6	65-3	65-0	64-5	64-2	63-6	63-3	63-0	62-5	62-2	61-6	61-3	61-0	60-5	60-2	59-7
79-7	66-2	65-7	65-4	65-1	64-6	64-2	63-7	63-4	63-1	62-6	62-2	61-7	61-4	61-1	60-6	60-2	59-7

80 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
80-0	79-5	79-2	78-6	78-3	78-0	77-5	77-2	76-6	76-3	76-0	75-5	75-2	74-6	74-3	74-0	73-5
80-1	79-6	79-3	78-7	78-4	78-1	77-6	77-3	76-7	76-4	76-1	75-6	75-3	74-7	74-4	74-1	73-6
80-2	79-7	79-4	79-0	78-5	78-2	77-7	77-4	77-0	76-5	76-2	75-7	75-3	75-0	74-5	74-2	73-7
80-3	80-0	79-5	79-1	78-6	78-3	78-0	77-4	77-1	76-6	76-3	76-0	75-4	75-1	74-6	74-3	74-0
80-4	80-1	79-6	79-2	78-7	78-4	78-1	77-5	77-2	76-7	76-4	76-1	75-5	75-2	74-7	74-4	74-0
80-5	80-2	79-7	79-3	79-0	78-5	78-2	77-6	77-3	77-0	76-5	76-2	75-6	75-3	75-0	74-5	74-1
80-6	80-3	80-0	79-4	79-1	78-6	78-3	77-7	77-4	77-1	76-6	76-2	75-7	75-4	75-1	74-6	74-2
80-7	80-4	80-1	79-5	79-2	78-7	78-4	78-0	77-5	77-2	76-7	76-3	76-0	75-5	75-2	74-6	74-3

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
80-0	73-2	72-6	72-3	72-0	71-5	71-2	70-6	70-3	70-0	69-5	69-2	68-6	68-3	68-0	67-5	67-2	66-6
80-1	73-3	72-7	72-4	72-1	71-6	71-2	70-7	70-4	70-1	69-6	69-2	68-7	68-4	68-1	67-6	67-2	66-7
80-2	73-3	73-0	72-5	72-2	71-7	71-3	71-0	70-5	70-2	69-7	69-3	69-0	68-5	68-2	67-6	67-3	67-0
80-3	73-4	73-1	72-6	72-3	72-0	71-4	71-1	70-6	70-3	69-7	69-4	69-1	68-6	68-3	67-7	67-4	67-1
80-4	73-5	73-2	72-7	72-4	72-0	71-5	71-2	70-7	70-4	70-0	69-5	69-2	68-7	68-3	68-0	67-5	67-2
80-5	73-6	73-3	73-0	72-5	72-1	71-6	71-3	71-0	70-4	70-1	69-6	69-3	68-7	68-4	68-1	67-6	67-3
80-6	73-7	73-4	73-1	72-5	72-2	71-7	71-4	71-0	70-5	70-2	69-7	69-4	69-0	68-5	68-2	67-7	67-3
80-7	74-0	73-5	73-2	72-6	72-3	72-0	71-5	71-1	70-6	70-3	70-0	69-4	69-1	68-6	68-3	67-7	67-4

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
80-0	66-3	66-0	65-5	65-2	64-6	64-3	64-0	63-5	63-2	62-6	62-3	62-0	61-5	61-2	60-6	60-3	60-0
80-1	66-4	66-1	65-6	65-2	64-7	64-4	64-1	63-6	63-2	62-7	62-4	62-1	61-6	61-2	60-7	60-4	60-1
80-2	66-5	66-2	65-6	65-3	65-0	64-5	64-2	63-6	63-3	63-0	62-5	62-2	61-6	61-3	61-0	60-5	60-2
80-3	66-6	66-2	65-7	65-4	65-1	64-6	64-2	63-7	63-4	63-1	62-6	62-2	61-7	61-4	61-1	60-5	60-2
80-4	66-7	66-3	66-0	65-5	65-2	64-6	64-3	64-0	63-5	63-2	62-6	62-3	62-0	61-5	61-1	60-6	60-3
80-5	66-7	66-4	66-1	65-6	65-2	64-7	64-4	64-1	63-6	63-2	62-7	62-4	62-1	61-5	61-2	60-7	60-4
80-6	67-0	66-5	66-2	65-6	65-3	65-0	64-5	64-2	63-6	63-3	63-0	62-5	62-1	61-6	61-3	61-0	60-5
80-7	67-1	66-6	66-3	65-7	65-4	65-1	64-6	64-2	63-7	63-4	63-1	62-5	62-2	61-7	61-4	61-0	60-5

81 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
81-0	80-5	80-2	79-6	79-3	79-0	78-5	78-1	77-6	77-3	77-0	76-4	76-1	75-6	75-3	74-7	74-4
81-1	80-6	80-3	79-7	79-4	79-1	78-6	78-2	77-7	77-4	77-1	76-5	76-2	75-7	75-4	75-0	74-5
81-2	80-7	80-4	80-0	79-5	79-2	78-7	78-3	78-0	77-5	77-2	76-6	76-3	76-0	75-5	75-1	74-6
81-3	81-0	80-4	80-1	79-6	79-3	78-7	78-4	78-1	77-6	77-2	76-7	76-4	76-1	75-5	75-2	74-7
81-4	81-1	80-5	80-2	79-7	79-4	79-0	78-5	78-2	77-7	77-3	77-0	76-5	76-2	75-6	75-3	75-0
81-5	81-2	80-6	80-3	80-0	79-5	79-1	78-6	78-3	78-0	77-4	77-1	76-6	76-3	75-7	75-4	75-1
81-6	81-3	80-7	80-4	80-1	79-6	79-2	78-7	78-4	78-1	77-5	77-2	76-7	76-3	76-0	75-5	75-2
81-7	81-4	81-0	80-5	80-2	79-7	79-3	79-0	78-5	78-1	77-6	77-3	77-0	76-4	76-1	75-6	75-3

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
81-0	74-1	73-6	73-2	72-7	72-4	72-1	71-5	71-2	70-7	70-4	70-1	69-5	69-2	68-7	68-4	68-0	67-5
81-1	74-2	73-7	73-3	73-0	72-5	72-2	71-6	71-3	71-0	70-5	70-1	69-6	69-3	69-0	68-4	68-1	67-6
81-2	74-3	74-0	73-4	73-1	72-6	72-3	71-7	71-4	71-1	70-6	70-2	69-7	69-4	69-1	68-5	68-2	67-7
81-3	74-4	74-0	73-5	73-2	72-7	72-3	72-0	71-5	71-2	70-6	70-3	70-0	69-5	69-1	68-6	68-3	68-0
81-4	74-5	74-1	73-6	73-3	73-0	72-4	72-1	71-6	71-3	70-7	70-4	70-1	69-5	69-2	68-7	68-4	68-0
81-5	74-5	74-2	73-7	73-4	73-0	72-5	72-2	71-7	71-3	71-0	70-5	70-2	69-6	69-3	69-0	68-5	68-1
81-6	74-6	74-3	74-0	73-5	73-1	72-6	72-3	72-0	71-4	71-1	70-6	70-2	69-7	69-4	69-1	68-5	68-2
81-7	74-7	74-4	74-1	73-6	73-2	72-7	72-4	72-0	71-5	71-2	70-7	70-3	70-0	69-5	69-1	68-6	68-3

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
81-0	67-2	66-7	66-3	66-0	65-5	65-2	64-6	64-3	64-0	63-5	63-1	62-6	62-3	62-0	61-4	61-1	60-6
81-1	67-3	66-7	66-4	66-1	65-6	65-2	64-7	64-4	64-1	63-5	63-2	62-7	62-4	62-0	61-5	61-2	60-7
81-2	67-4	67-0	66-5	66-2	65-7	65-3	65-0	64-5	64-2	63-6	63-3	63-0	62-5	62-1	61-6	61-3	61-0
81-3	67-4	67-1	66-6	66-3	65-7	65-4	65-1	64-6	64-2	63-7	63-4	63-1	62-5	62-2	61-7	61-4	61-0
81-4	67-5	67-2	66-7	66-3	66-0	65-5	65-2	64-6	64-3	64-0	63-5	63-1	62-6	62-3	62-0	61-4	61-1
81-5	67-6	67-3	66-7	66-4	66-1	65-6	65-2	64-7	64-4	64-1	63-5	63-2	62-7	62-4	62-0	61-5	61-2
81-6	67-7	67-4	67-0	66-5	66-2	65-6	65-3	65-0	64-5	64-1	63-6	63-3	63-0	62-4	62-1	61-6	61-3
81-7	68-0	67-5	67-1	66-6	66-3	65-7	65-4	65-1	64-6	64-2	63-7	63-4	63-0	62-5	62-2	61-7	61-3

82 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
81-0	81-5	81-1	80-6	80-3	80-0	79-4	79-1	78-6	78-2	77-7	77-4	77-1	76-5	76-2	75-7	75-4
82-1	81-6	81-2	80-7	80-4	80-1	79-5	79-2	78-7	78-3	78-0	77-5	77-2	76-6	76-3	76-0	75-4
82-2	81-7	81-3	81-0	80-5	80-2	79-6	79-3	79-0	78-4	78-1	77-6	77-3	76-7	76-4	76-1	75-5
82-3	82-0	81-4	81-1	80-6	80-3	79-7	79-4	79-1	78-5	78-2	77-7	77-3	77-0	76-5	76-2	75-6
82-4	82-1	81-5	81-2	80-7	80-4	80-0	79-5	79-2	78-6	78-3	78-0	77-4	77-1	76-6	76-3	75-7
82-5	82-2	81-6	81-3	81-0	80-4	80-1	79-6	79-3	78-7	78-4	78-1	77-5	77-2	76-7	76-3	76-0
82-6	82-3	81-7	81-4	81-1	80-5	80-2	79-7	79-4	79-0	78-5	78-2	77-6	77-3	77-0	76-4	76-1
82-7	82-4	82-0	81-5	81-2	80-6	80-3	80-0	79-4	79-1	78-6	78-3	77-7	77-4	77-1	76-5	76-2

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
82-0	75-0	74-5	74-2	73-6	73-3	73-0	72-5	72-1	71-6	71-3	70-7	70-4	70-1	69-6	69-2	68-7	68-4
82-1	75-1	74-6	74-3	73-7	73-4	73-1	72-5	72-2	71-7	71-4	71-0	70-5	70-2	69-6	69-3	69-0	68-5
82-2	75-2	74-7	74-3	74-0	73-5	73-2	72-6	72-3	72-0	71-4	71-1	70-6	70-3	69-7	69-4	69-1	68-5
82-3	75-3	75-0	74-4	74-1	73-6	73-3	72-7	72-4	72-1	71-5	71-2	70-7	70-3	70-0	69-5	69-2	68-6
82-4	75-4	75-1	74-5	74-2	73-7	73-3	73-0	72-5	72-2	71-6	71-3	71-0	70-4	70-1	69-6	69-2	68-7
82-5	75-5	75-2	74-6	74-3	74-0	73-4	73-1	72-6	72-2	71-7	71-4	71-0	70-5	70-2	69-7	69-3	69-0
82-6	75-6	75-2	74-7	74-4	74-0	73-5	73-2	72-7	72-3	72-0	71-5	71-1	70-6	70-3	69-7	69-4	69-1
82-7	75-7	75-3	75-0	74-5	74-1	73-6	73-3	73-0	72-4	72-1	71-5	71-2	70-7	70-4	70-0	69-5	69-2

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
82-0	68-0	67-5	67-2	66-7	66-3	66-0	65-5	65-2	64-6	64-3	64-0	63-4	63-1	62-6	62-3	61-7	61-4
82-1	68-1	67-6	67-3	66-7	66-4	66-1	65-6	65-2	64-7	64-4	64-0	63-5	63-2	62-7	62-3	62-0	61-5
82-2	68-2	67-7	67-4	67-0	66-5	66-2	65-6	65-3	65-0	64-5	64-1	63-6	63-3	62-7	62-4	62-1	61-6
82-3	68-3	68-0	67-4	67-1	66-6	66-2	65-7	65-4	65-1	64-5	64-2	63-7	63-3	63-0	62-5	62-2	61-6
82-4	68-4	68-1	67-5	67-2	66-7	66-3	66-0	65-5	65-1	64-6	64-3	64-0	63-4	63-1	62-6	62-2	61-7
82-5	68-5	68-1	67-6	67-3	66-7	66-4	66-1	65-5	65-2	64-7	64-4	64-0	63-5	63-2	62-6	62-3	62-0
82-6	68-5	68-2	67-7	67-4	67-0	66-5	66-2	65-6	65-3	65-0	64-4	64-1	63-6	63-2	62-7	62-4	62-1
82-7	68-6	68-3	68-0	67-4	67-1	66-6	66-2	65-7	65-4	65-0	64-5	64-2	63-7	63-3	63-0	62-5	62-1

83 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
83-0	82-5	82-1	81-6	81-3	80-7	80-4	80-1	79-5	79-2	78-7	78-3	78-0	77-5	77-2	76-6	76-3
83-1	82-6	82-2	81-7	81-4	81-0	80-5	80-2	79-6	79-3	79-0	78-4	78-1	77-6	77-2	76-7	76-4
83-2	82-7	82-3	82-0	81-5	81-1	80-6	80-3	79-7	79-4	79-1	78-5	78-2	77-7	77-3	77-0	76-5
83-3	83-0	82-4	82-1	81-6	81-2	80-7	80-4	80-0	79-5	79-2	78-6	78-3	78-0	77-4	77-1	76-6
83-4	83-1	82-5	82-2	81-7	81-3	81-0	80-5	80-1	79-6	79-3	78-7	78-4	78-1	77-5	77-2	76-7
83-5	83-2	82-6	82-3	82-0	81-4	81-1	80-6	80-2	79-7	79-4	79-0	78-5	78-2	77-6	77-3	76-7
83-6	83-3	82-7	82-4	82-1	81-5	81-2	80-7	80-3	80-0	79-5	79-1	78-6	78-2	77-7	77-4	77-0
83-7	83-4	83-0	82-5	82-2	81-6	81-3	81-0	80-4	80-1	79-5	79-2	78-7	78-3	78-0	77-5	77-1

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
83-0	76-0	75-4	75-1	74-6	74-2	73-7	73-4	73-0	72-5	72-2	71-6	71-3	71-0	70-4	70-1	69-6	69-2
83-1	76-0	75-5	75-2	74-7	74-3	74-0	73-5	73-1	72-6	72-3	71-7	71-4	71-1	70-5	70-2	69-7	69-3
83-2	76-1	75-6	75-3	74-7	74-4	74-1	73-5	73-2	72-7	72-3	72-0	71-5	71-1	70-6	70-3	69-7	69-4
83-3	76-2	75-7	75-4	75-0	74-5	74-2	73-6	73-3	73-0	72-4	72-1	71-6	71-2	70-7	70-4	70-0	69-5
83-4	76-3	76-0	75-5	75-1	74-6	74-3	73-7	73-4	73-1	72-5	72-2	71-6	71-3	71-0	70-4	70-1	69-6
83-5	76-4	76-1	75-5	75-2	74-7	74-3	74-0	73-5	73-1	72-6	72-3	71-7	71-4	71-1	70-5	70-2	69-7
83-6	76-5	76-2	75-6	75-3	75-0	74-4	74-1	73-6	73-2	72-7	72-4	72-0	71-5	71-2	70-6	70-3	69-7
83-7	76-6	76-3	75-7	75-4	75-1	74-5	74-2	73-6	73-3	73-0	72-4	72-1	71-6	71-2	70-7	70-4	70-0

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
83-0	68-7	68-4	68-0	67-5	67-2	66-7	66-3	66-0	65-5	65-1	64-6	64-3	63-7	63-4	63-1	62-5	62-2
83-1	69-0	68-5	68-1	67-6	67-3	66-7	66-4	66-1	65-5	65-2	64-7	64-3	64-0	63-5	63-1	62-6	62-3
83-2	69-1	68-5	68-2	67-7	67-3	67-0	66-5	66-1	65-6	65-3	64-7	64-4	64-1	63-5	63-2	62-7	62-4
83-3	69-2	68-6	68-3	68-0	67-4	67-1	66-6	66-2	65-7	65-4	65-0	64-5	64-2	63-6	63-3	63-0	62-4
83-4	69-2	68-7	68-4	68-0	67-5	67-2	66-6	66-3	66-0	65-4	65-1	64-6	64-2	63-7	63-4	63-0	62-5
83-5	69-3	69-0	68-5	68-1	67-6	67-3	66-7	66-4	66-1	65-5	65-2	64-6	64-3	64-0	63-4	63-1	62-6
83-6	69-4	69-1	68-5	68-2	67-7	67-3	67-0	66-5	66-1	65-6	65-3	64-7	64-4	64-1	63-5	63-2	62-7
83-7	69-5	69-2	68-6	68-3	68-0	67-4	67-1	66-5	66-2	65-7	65-3	65-0	64-5	64-1	63-6	63-3	62-7

84 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
84-0	83-5	83-1	82-6	82-3	81-7	81-4	81-0	80-5	80-2	79-6	79-3	79-0	78-4	78-1	77-6	77-2
84-1	83-6	83-2	82-7	82-4	82-0	81-5	81-1	80-6	80-3	79-7	79-4	79-1	78-5	78-2	77-7	77-3
84-2	83-7	83-3	83-0	82-5	82-1	81-6	81-2	80-7	80-4	80-0	79-5	79-2	78-6	78-3	77-7	77-4
84-3	84-0	83-4	83-1	82-6	82-2	81-7	81-3	81-0	80-5	80-1	79-6	79-3	78-7	78-4	78-0	77-5
84-4	84-1	83-5	83-2	82-6	82-3	82-0	81-4	81-1	80-6	80-2	79-7	79-3	79-0	78-5	78-1	77-6
84-5	84-2	83-6	83-3	82-7	82-4	82-1	81-5	81-2	80-7	80-3	80-0	79-4	79-1	78-6	78-2	77-7
84-6	84-3	83-7	83-4	83-0	82-5	82-2	81-6	81-3	80-7	80-4	80-1	79-5	79-2	78-7	78-3	78-0
84-7	84-4	84-0	83-5	83-1	82-6	82-3	81-7	81-4	81-0	80-5	80-2	79-6	79-3	78-7	78-4	78-1

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
84-0	76-7	76-4	76-0	75-5	75-1	74-6	74-3	73-7	73-4	73-1	72-5	72-2	71-7	71-3	71-0	70-4	70-1
84-1	77-0	76-4	76-1	75-6	75-2	74-7	74-4	74-0	73-5	73-2	72-6	72-3	71-7	71-4	71-1	70-5	70-2
84-2	77-1	76-5	76-2	75-7	75-3	75-0	74-4	74-1	73-6	73-2	72-7	72-4	72-0	71-5	71-2	70-6	70-3
84-3	77-2	76-6	76-3	76-0	75-4	75-1	74-5	74-2	73-7	73-3	73-0	72-5	72-1	71-6	71-2	70-7	70-4
84-4	77-3	76-7	76-4	76-0	75-5	75-2	74-6	74-3	74-0	73-4	73-1	72-5	72-2	71-7	71-3	71-0	70-4
84-5	77-3	77-0	76-5	76-1	75-6	75-3	74-7	74-4	74-0	73-5	73-2	72-6	72-3	71-7	71-4	71-1	70-5
84-6	77-4	77-1	76-6	76-2	75-7	75-3	75-0	74-5	74-1	73-6	73-2	72-7	72-4	72-0	71-5	71-2	70-6
84-7	77-5	77-2	76-6	76-3	76-0	75-4	75-1	74-6	74-2	73-7	73-3	73-0	72-5	72-1	71-6	71-2	70-7

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
84-0	69-6	69-2	68-7	68-4	68-0	67-5	67-2	66-6	66-3	65-7	65-4	65-1	64-5	64-2	63-7	63-3	63-0
84-1	69-7	69-3	69-0	68-4	68-1	67-6	67-2	66-7	66-4	66-0	65-5	65-2	64-6	64-3	63-7	63-4	63-1
84-2	69-7	69-4	69-1	68-5	68-2	67-7	67-3	67-0	66-4	66-1	65-6	65-2	64-7	64-4	64-0	63-5	63-2
84-3	70-0	69-5	69-2	68-6	68-3	67-7	67-4	67-1	66-5	66-2	65-7	65-3	65-0	64-4	64-1	63-6	63-2
84-4	70-1	69-6	69-2	68-7	68-4	68-0	67-5	67-1	66-6	66-3	65-7	65-4	65-1	64-5	64-2	63-6	63-3
84-5	70-2	69-7	69-3	69-0	68-4	68-1	67-6	67-2	66-7	66-3	66-0	65-5	65-1	64-6	64-3	63-7	63-4
84-6	70-3	69-7	69-4	69-1	68-5	68-2	67-6	67-3	67-0	66-4	66-1	65-5	65-2	64-7	64-3	64-0	63-5
84-7	70-4	70-0	69-5	69-1	68-6	68-3	67-7	67-4	67-0	66-5	66-2	65-6	65-3	64-7	64-4	64-1	63-5

85 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
85-0	84-5	84-1	83-6	83-2	82-7	82-4	82-0	81-5	81-1	80-6	80-3	79-7	79-4	79-0	78-5	78-2
85-1	84-6	84-2	83-7	83-3	83-0	82-5	82-1	81-6	81-2	80-7	80-4	80-0	79-5	79-1	78-6	78-3
85-2	84-7	84-3	84-0	83-4	83-1	82-6	82-2	81-7	81-3	81-0	80-4	80-1	79-6	79-2	78-7	78-3
85-3	85-0	84-4	84-1	83-5	83-2	82-7	82-3	82-0	81-4	81-1	80-5	80-2	79-7	79-3	79-0	78-4
85-4	85-1	84-5	84-2	83-6	83-3	82-7	82-4	82-1	81-5	81-2	80-6	80-3	80-0	79-4	79-1	78-5
85-5	85-2	84-6	84-3	83-7	83-4	83-0	82-5	82-2	81-6	81-3	80-7	80-4	80-0	79-5	79-2	78-6
85-6	85-3	84-7	84-4	84-0	83-5	83-1	82-6	82-3	81-7	81-4	81-0	80-5	80-1	79-6	79-3	78-7
85-7	85-4	85-0	84-5	84-1	83-6	83-2	82-7	82-4	82-0	81-5	81-1	80-6	80-2	79-7	79-3	79-0

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
85-0	77-6	77-3	76-7	76-4	76-1	75-5	75-2	74-6	74-3	74-0	73-4	73-1	72-5	72-2	71-7	71-3	71-0
85-1	77-7	77-4	77-0	76-5	76-1	75-6	75-3	74-7	74-4	74-0	73-5	73-2	72-6	72-3	71-7	71-4	71-1
85-2	78-0	77-5	77-1	76-6	76-2	75-7	75-4	75-0	74-5	74-1	73-6	73-3	72-7	72-4	72-0	71-5	71-1
85-3	78-1	77-6	77-2	76-7	76-3	76-0	75-4	75-1	74-6	74-2	73-7	73-3	73-0	72-5	72-1	71-6	71-2
85-4	78-2	77-6	77-3	77-0	76-4	76-1	75-5	75-2	74-7	74-3	74-0	73-4	73-1	72-5	72-2	71-7	71-3
85-5	78-3	77-7	77-4	77-1	76-5	76-2	75-6	75-3	74-7	74-4	74-1	73-5	73-2	72-6	72-3	71-7	71-4
85-6	78-4	78-0	77-5	77-1	76-6	76-3	75-7	75-4	75-0	74-5	74-1	73-6	73-3	72-7	72-4	72-0	71-5
85-7	78-5	78-1	77-6	77-2	76-7	76-3	76-0	75-5	75-1	74-6	74-2	73-7	73-3	73-0	72-5	72-1	71-6

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
85-0	70-4	70-1	69-6	69-2	68-7	68-3	68-0	67-5	67-1	66-6	66-2	65-7	65-4	65-0	64-5	64-1	63-6
85-1	70-5	70-2	69-6	69-3	69-0	68-4	68-1	67-5	67-2	66-7	66-3	66-0	65-4	65-1	64-6	64-2	63-7
85-2	70-6	70-3	69-7	69-4	69-0	68-5	68-2	67-6	67-3	66-7	66-4	66-1	65-5	65-2	64-6	64-3	64-0
85-3	70-7	70-3	70-0	69-5	69-1	68-6	68-2	67-7	67-4	67-0	66-5	66-1	65-6	65-2	64-7	64-4	64-0
85-4	71-0	70-4	70-1	69-5	69-2	68-7	68-3	68-0	67-4	67-1	66-6	66-2	65-7	65-3	65-0	64-4	64-1
85-5	71-1	70-5	70-2	69-6	69-3	68-7	68-4	68-1	67-5	67-2	66-6	66-3	65-7	65-4	65-1	64-5	64-2
85-6	71-1	70-6	70-3	69-7	69-4	69-0	68-5	68-1	67-6	67-3	66-7	66-4	66-0	65-5	65-1	64-6	64-3
85-7	71-2	70-7	70-3	70-0	69-4	69-1	68-6	68-2	67-7	67-3	67-0	66-5	66-1	65-6	65-2	64-7	64-3

86 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
86-0	85-5	85-1	84-6	84-2	83-7	83-3	83-0	82-4	82-1	81-6	81-2	80-7	80-3	80-0	79-4	79-1
86-1	85-6	85-2	84-7	84-3	84-0	83-4	83-1	82-5	82-2	81-7	81-3	81-0	80-4	80-1	79-5	79-2
86-2	85-7	85-3	85-0	84-4	84-1	83-5	83-2	82-6	82-3	82-0	81-4	81-1	80-5	80-2	79-6	79-3
86-3	86-0	85-4	85-1	84-5	84-2	83-6	83-3	82-7	82-4	82-0	81-5	81-2	80-6	80-3	79-7	79-4
86-4	86-1	85-5	85-2	84-6	84-3	83-7	83-4	83-0	82-5	82-1	81-6	81-2	80-7	80-4	80-0	79-5
86-5	86-2	85-6	85-3	84-7	84-4	84-0	83-5	83-1	82-6	82-2	81-7	81-3	81-0	80-4	80-1	79-6
86-6	86-3	85-7	85-4	85-0	84-5	84-1	83-6	83-2	82-7	82-3	82-0	81-4	81-1	80-5	80-2	79-6
86-7	86-4	86-0	85-5	85-1	84-6	84-2	83-7	83-3	83-0	82-4	82-1	81-5	81-2	80-6	80-3	79-7

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
86-0	78-6	78-2	77-7	77-3	77-0	76-4	76-1	75-5	75-2	74-7	74-3	74-0	73-4	73-1	72-5	72-2	71-6
86-1	78-6	78-3	78-0	77-4	77-1	76-5	76-2	75-6	75-3	74-7	74-4	74-1	73-5	73-2	72-6	72-3	71-7
86-2	78-7	78-4	78-0	77-5	77-2	76-6	76-3	75-7	75-4	75-0	74-5	74-1	73-6	73-3	72-7	72-4	72-0
86-3	79-0	78-5	78-1	77-6	77-2	76-7	76-4	76-0	75-5	75-1	74-6	74-2	73-7	73-3	73-0	72-4	72-1
86-4	79-1	78-6	78-2	77-7	77-3	77-0	76-4	76-1	75-6	75-2	74-7	74-3	74-0	73-4	73-1	72-5	72-2
86-5	79-2	78-7	78-3	78-0	77-4	77-1	76-5	76-2	75-6	75-3	74-7	74-4	74-1	73-5	73-2	72-6	72-3
86-6	79-3	79-0	78-4	78-1	77-5	77-2	76-6	76-3	75-7	75-4	75-0	74-5	74-1	73-6	73-2	72-7	72-3
86-7	79-4	79-0	78-5	78-2	77-6	77-3	76-7	76-4	76-0	75-5	75-1	74-6	74-2	73-7	73-3	73-0	72-4

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
86-0	71-3	71-0	70-4	70-1	69-5	69-2	68-6	68-3	68-0	67-4	67-1	66-5	66-2	65-6	65-3	64-7	64-4
86-1	71-4	71-0	70-5	70-2	69-6	69-3	68-7	68-4	68-0	67-5	67-1	66-6	66-3	65-7	65-4	65-0	64-5
86-2	71-5	71-1	70-6	70-2	69-7	69-3	69-0	68-5	68-1	67-6	67-2	66-7	66-3	66-0	65-4	65-1	64-6
86-3	71-6	71-2	70-7	70-3	70-0	69-4	69-1	68-5	68-2	67-6	67-3	67-0	66-4	66-1	65-5	65-2	64-6
86-4	71-6	71-3	70-7	70-4	70-1	69-5	69-2	68-6	68-3	67-7	67-4	67-0	66-5	66-1	65-6	65-2	64-7
86-5	71-7	71-4	71-0	70-5	70-1	69-6	69-2	68-7	68-3	68-0	67-5	67-1	66-6	66-2	65-7	65-3	65-0
86-6	72-0	71-5	71-1	70-6	70-2	69-7	69-3	69-0	68-4	68-1	67-5	67-2	66-6	66-3	65-7	65-4	65-1
86-7	72-1	71-5	71-2	70-6	70-3	69-7	69-4	69-1	68-5	68-2	67-6	67-3	66-7	66-4	66-0	65-5	65-1

87 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
87-0	86-5	86-1	85-6	85-2	84-7	84-3	84-0	83-4	83-1	82-5	82-2	81-6	81-3	80-7	80-4	80-0
87-1	86-6	86-2	85-7	85-3	85-0	84-4	84-1	83-5	83-2	82-6	82-3	81-7	81-4	81-0	80-5	80-1
87-2	86-7	86-3	86-0	85-4	85-1	84-5	84-2	83-6	83-3	82-7	82-4	82-0	81-5	81-1	80-6	80-2
87-3	87-0	86-4	86-1	85-5	85-2	84-6	84-3	83-7	83-4	83-0	82-5	82-1	81-6	81-2	80-7	80-3
87-4	87-1	86-5	86-2	85-6	85-3	84-7	84-4	84-0	83-5	83-1	82-6	82-2	81-7	81-3	81-0	80-4
87-5	87-1	86-6	86-2	85-7	85-3	85-0	84-4	84-1	83-5	83-2	82-6	82-3	81-7	81-4	81-0	80-5
87-6	87-2	86-7	86-3	86-0	85-4	85-1	84-5	84-2	83-6	83-3	82-7	82-4	82-0	81-5	81-1	80-6
87-7	87-3	87-0	86-4	86-1	85-5	85-2	84-6	84-3	83-7	83-4	83-0	82-5	82-1	81-6	81-2	80-7

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
87-0	79-5	79-1	78-6	78-2	77-7	77-3	77-0	76-4	76-1	75-6	75-2	74-7	74-3	74-0	73-4	73-1	72-5
87-1	79-6	79-2	78-7	78-3	78-0	77-4	77-1	76-5	76-2	75-6	75-3	74-7	74-4	74-0	73-5	73-1	72-6
87-2	79-7	79-3	79-0	78-4	78-1	77-5	77-2	76-6	76-3	75-7	75-4	75-0	74-5	74-1	73-6	73-2	72-7
87-3	80-0	79-4	79-1	78-5	78-2	77-6	77-3	76-7	76-4	76-0	75-5	75-1	74-6	74-2	73-7	73-3	73-0
87-4	80-1	79-5	79-2	78-6	78-3	77-7	77-4	77-0	76-5	76-1	75-6	75-2	74-7	74-3	74-0	73-4	73-1
87-5	80-1	79-6	79-2	78-7	78-3	78-0	77-4	77-1	76-5	76-2	75-6	75-3	74-7	74-4	74-0	73-5	73-1
87-6	80-2	79-7	79-3	79-0	78-4	78-1	77-5	77-2	76-6	76-3	75-7	75-4	75-0	74-5	74-1	73-6	73-2
87-7	80-3	80-0	79-4	79-1	78-5	78-2	77-6	77-3	76-7	76-4	76-0	75-5	75-1	74-6	74-2	73-7	73-3

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
87-0	72-2	71-6	71-3	70-7	70-4	70-0	69-5	69-1	68-6	68-2	67-7	67-3	67-0	66-4	66-1	65-5	65-2
87-1	72-3	71-7	71-4	71-0	70-5	70-1	69-6	69-2	68-7	68-3	68-0	67-4	67-1	66-5	66-2	65-6	65-3
87-2	72-3	72-0	71-4	71-1	70-5	70-2	69-6	69-3	68-7	68-4	68-0	67-5	67-1	66-6	66-2	65-7	65-4
87-3	72-4	72-1	71-5	71-2	70-6	70-3	69-7	69-4	69-0	68-5	68-1	67-6	67-2	66-7	66-3	66-0	65-4
87-4	72-5	72-2	71-6	71-3	70-7	70-4	70-0	69-5	69-1	68-6	68-2	67-7	67-3	67-0	66-4	66-1	65-5
87-5	72-6	72-2	71-7	71-3	71-0	70-4	70-1	69-5	69-2	68-6	68-3	67-7	67-4	67-0	66-5	66-1	65-6
87-6	72-7	72-3	72-0	71-4	71-1	70-5	70-2	69-6	69-3	68-7	68-4	68-0	67-5	67-1	66-6	66-2	65-7
87-7	73-0	72-4	72-0	71-5	71-1	70-6	70-3	69-7	69-3	69-0	68-4	68-1	67-5	67-2	66-6	66-3	65-7

88 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
88-0	87-4	87-1	86-5	86-2	85-6	85-3	84-7	84-4	84-0	83-5	83-1	82-6	82-2	81-7	81-3	81-0
88-1	87-5	87-2	86-6	86-3	85-7	85-4	85-0	84-5	84-1	83-6	83-2	82-7	82-3	82-0	81-4	81-1
88-2	87-6	87-3	86-7	86-4	86-0	85-5	85-1	84-6	84-2	83-7	83-3	83-0	82-4	82-1	81-5	81-2
88-3	87-7	87-4	87-0	86-5	86-1	85-6	85-2	84-7	84-3	84-0	83-4	83-1	82-5	82-2	81-6	81-2
88-4	88-0	87-5	87-1	86-6	86-2	85-7	85-3	85-0	84-4	84-1	83-5	83-2	82-6	82-2	81-7	81-3
88-5	88-1	87-6	87-2	86-7	86-3	86-0	85-4	85-1	84-5	84-2	83-6	83-2	82-7	82-3	82-0	81-4
88-6	88-2	87-7	87-3	87-0	86-4	86-1	85-5	85-2	84-6	84-3	83-7	83-3	83-0	82-4	82-1	81-5
88-7	88-3	88-0	87-4	87-1	86-5	86-2	85-6	85-3	84-7	84-3	84-0	83-4	83-1	82-5	82-2	81-6

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
88-0	80-4	80-1	79-5	79-2	78-6	78-3	77-7	77-4	77-0	76-4	76-1	75-5	75-2	74-6	74-3	73-7	73-4
88-1	80-5	80-2	79-6	79-3	78-7	78-3	78-0	77-4	77-1	76-5	76-2	75-6	75-3	74-7	74-4	74-0	73-5
88-2	80-6	80-2	79-7	79-3	79-0	78-4	78-1	77-5	77-2	76-6	76-3	75-7	75-4	75-0	74-5	74-1	73-6
88-3	80-7	80-3	80-0	79-4	79-1	78-5	78-2	77-6	77-3	76-7	76-4	76-0	75-4	75-1	74-5	74-2	73-6
88-4	81-0	80-4	80-1	79-5	79-2	78-6	78-3	77-7	77-4	77-0	76-4	76-1	75-5	75-2	74-6	74-3	73-7
88-5	81-1	80-5	80-2	79-6	79-3	78-7	78-3	78-0	77-4	77-1	76-5	76-2	75-6	75-3	74-7	74-4	74-0
88-6	81-2	80-6	80-3	79-7	79-3	79-0	78-4	78-1	77-5	77-2	76-6	76-3	75-7	75-4	75-0	74-4	74-1
88-7	81-3	80-7	80-3	80-0	79-4	79-1	78-5	78-2	77-6	77-3	76-7	76-3	76-0	75-4	75-1	74-5	74-2

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
88-0	73-0	72-5	72-1	71-6	71-2	70-7	70-3	70-0	69-4	69-1	68-5	68-2	67-6	67-3	66-7	66-4	66-0
88-1	73-1	72-6	72-2	71-7	71-3	71-0	70-4	70-0	69-5	69-1	68-6	68-2	67-7	67-3	67-0	66-4	66-1
88-2	73-2	72-6	72-3	71-7	71-4	71-0	70-5	70-1	69-6	69-2	68-7	68-3	68-0	67-4	67-1	66-5	66-2
88-3	77-3	72-7	72-4	72-0	71-5	71-1	70-6	70-2	69-7	69-3	68-7	68-4	68-0	67-5	67-1	66-6	66-2
88-4	73-4	73-0	72-5	72-1	71-6	71-2	70-6	70-3	69-7	69-4	69-0	68-5	68-1	67-6	67-2	66-7	66-3
88-5	73-4	73-1	72-5	72-2	71-6	71-3	70-7	70-4	70-0	69-5	69-1	68-5	68-2	67-6	67-3	66-7	66-4
88-6	73-5	73-2	72-6	72-3	71-7	71-4	71-0	70-4	70-1	69-5	69-2	68-6	68-3	67-7	67-4	67-0	66-5
88-7	73-6	73-3	72-7	72-3	72-0	71-4	71-1	70-5	70-2	69-6	69-3	68-7	68-3	68-0	67-4	67-1	66-5

89 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
89-0	88-4	88-1	87-5	87-2	86-6	86-3	85-7	85-4	85-0	84-4	84-1	83-5	83-2	82-6	82-3	81-7
89-1	88-5	88-2	87-6	87-3	86-7	86-4	86-0	85-4	85-1	84-5	84-2	83-6	83-3	82-7	82-4	82-0
89-2	88-6	88-3	87-7	87-4	87-0	86-5	86-1	85-5	85-2	84-6	84-3	83-7	83-4	83-0	82-4	82-1
89-3	88-7	88-4	88-0	87-5	87-1	86-6	86-2	85-6	85-3	84-7	84-4	84-0	83-5	83-1	82-5	82-2
89-4	89-0	88-5	88-1	87-6	87-2	86-7	86-3	85-7	85-4	85-0	84-5	84-1	83-5	83-2	82-6	82-3
89-5	89-1	88-6	88-2	87-7	87-3	86-7	86-4	86-0	85-5	85-1	84-6	84-2	83-6	83-3	82-7	82-4
89-6	89-2	88-7	88-3	88-0	87-4	87-0	86-5	86-1	85-6	85-2	84-7	84-3	83-7	83-4	83-0	82-5
89-7	89-3	89-0	88-4	88-1	87-5	87-1	86-6	86-2	85-7	85-3	84-7	84-4	84-0	83-5	83-1	82-5

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
89-0	81-3	81-0	80-4	80-1	79-5	79-2	78-6	78-3	77-7	77-3	77-0	76-4	76-1	75-5	75-2	74-6	74-3
89-1	81-4	81-1	80-5	80-2	79-6	79-3	78-7	78-3	78-0	77-4	77-1	76-5	76-2	75-6	75-2	74-7	74-3
89-2	81-5	81-2	80-6	80-3	79-7	79-3	79-0	78-4	78-1	77-5	77-2	76-6	76-2	75-7	75-3	75-0	74-4
89-3	81-6	81-3	80-7	80-4	80-0	79-4	79-1	78-5	78-2	77-6	77-2	76-7	76-3	76-0	75-4	75-1	74-5
89-4	81-7	81-4	81-0	80-4	80-1	79-5	79-2	78-6	78-3	77-7	77-3	77-0	76-4	76-1	75-5	75-1	74-6
89-5	82-0	81-4	81-1	80-5	80-2	79-6	79-3	78-7	78-3	78-0	77-4	77-1	76-5	76-1	75-6	75-2	74-7
89-6	82-1	81-5	81-2	80-6	80-3	79-7	79-3	79-0	78-4	78-1	77-5	77-1	76-6	76-2	75-7	75-3	75-0
89-7	82-2	81-6	81-3	80-7	80-4	80-0	79-4	79-1	78-5	78-2	77-6	77-2	76-7	76-3	76-0	75-4	75-0

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
89-0	73-7	73-3	73-0	72-4	72-1	71-5	71-2	70-6	70-2	69-7	69-3	69-0	68-4	68-1	67-5	67-2	66-6
89-1	74-0	73-4	73-1	72-5	72-2	71-6	71-2	70-7	70-3	70-0	69-4	69-1	68-5	68-1	67-6	67-2	66-7
89-2	74-1	73-5	73-1	72-6	72-2	71-7	71-3	71-0	70-4	70-0	69-5	69-1	68-6	68-2	67-7	67-3	67-0
89-3	74-1	73-6	73-2	72-7	72-3	72-0	71-4	71-0	70-5	70-1	69-6	69-2	68-7	68-3	67-7	67-4	67-0
89-4	74-2	73-7	73-3	73-0	72-4	72-0	71-5	71-1	70-6	70-2	69-6	69-3	68-7	68-4	68-0	67-5	67-1
89-5	74-3	74-0	73-4	73-0	72-5	72-1	71-6	71-2	70-6	70-3	69-7	69-4	69-0	68-5	68-1	67-5	67-2
89-6	74-4	74-0	73-5	73-1	72-6	72-2	71-6	71-3	70-7	70-4	70-0	69-4	69-1	68-5	68-2	67-6	67-3
89-7	74-5	74-1	73-6	73-2	72-6	72-3	71-7	71-4	71-0	70-4	70-1	69-5	69-2	68-6	68-2	67-7	67-3

90 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
90-0	89-4	89-1	88-5	88-2	87-6	87-2	86-7	86-3	86-0	85-4	85-0	84-5	84-1	83-6	83-2	82-6
90-1	89-5	89-2	88-6	88-3	87-7	87-3	87-0	86-4	86-1	85-5	85-1	84-6	84-2	83-7	83-3	82-7
90-2	89-6	89-3	88-7	88-4	88-0	87-4	87-1	86-5	86-2	85-6	85-2	84-7	84-3	83-7	83-4	83-0
90-3	89-7	89-4	89-0	88-5	88-1	87-5	87-2	86-6	86-2	85-7	85-3	85-0	84-4	84-0	83-5	83-1
90-4	90-0	89-5	89-1	88-6	88-2	87-6	87-3	86-7	86-3	86-0	85-4	85-1	84-5	84-1	83-6	83-2
90-5	90-1	89-6	89-2	88-7	88-3	87-7	87-4	87-0	86-4	86-1	85-5	85-2	84-6	84-2	83-7	83-3
90-6	90-2	89-7	89-3	88-7	88-4	88-0	87-5	87-1	86-5	86-2	85-6	85-2	84-7	84-3	84-0	83-4
90-7	90-3	90-0	89-4	89-0	88-5	88-1	87-6	87-2	86-6	86-3	85-7	85-3	85-0	84-4	84-0	83-5

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
90-0	82-3	81-7	81-4	81-0	80-4	80-1	79-5	79-2	78-6	78-2	77-7	77-3	77-0	76-4	76-0	75-5	75-1
90-1	82-4	82-0	81-5	81-1	80-5	80-2	79-6	79-2	78-7	78-3	78-0	77-4	77-0	76-5	76-1	75-6	75-2
90-2	82-5	82-1	81-5	81-2	80-6	80-3	79-7	79-3	79-0	78-4	78-1	77-5	77-1	76-6	76-2	75-6	75-3
90-3	82-6	82-2	81-6	81-3	80-7	80-3	80-0	79-4	79-1	78-5	78-1	77-6	77-2	76-7	76-3	75-7	75-4
90-4	82-6	82-3	81-7	81-4	81-0	80-4	80-1	79-5	79-2	78-6	78-2	77-7	77-3	76-7	76-4	76-0	75-5
90-5	82-7	82-4	82-0	81-5	81-1	80-5	80-2	79-6	79-2	78-7	78-3	78-0	77-4	77-0	76-5	76-1	75-5
90-6	83-0	82-5	82-1	81-5	81-2	80-6	80-3	79-7	79-3	79-0	78-4	78-0	77-5	77-1	76-6	76-2	75-6
90-7	83-1	82-6	82-2	81-6	81-3	80-7	80-3	80-0	79-4	79-0	78-5	78-1	77-6	77-2	76-6	76-3	75-7

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
90-0	74-6	74-2	73-6	73-3	72-7	72-4	72-0	71-4	71-1	70-5	70-2	69-6	69-2	68-7	68-3	68-0	67-4
90-1	74-6	74-3	73-7	73-4	73-0	72-4	72-1	71-5	71-2	70-6	70-2	69-7	69-3	69-0	68-4	68-0	67-5
90-2	74-7	74-4	74-0	73-4	73-1	72-5	72-2	71-6	71-2	70-7	70-3	70-0	69-4	69-0	68-5	68-1	67-6
90-3	75-0	74-4	74-1	73-5	73-2	72-6	72-2	71-7	71-3	71-0	70-4	70-0	69-5	69-1	68-5	68-2	67-6
90-4	75-1	74-5	74-2	73-6	73-2	72-7	72-3	72-0	71-4	71-0	70-5	70-1	69-5	69-2	68-6	68-3	67-7
90-5	75-2	74-6	74-3	73-7	73-3	73-0	72-4	72-0	71-5	71-1	70-6	70-2	69-6	69-3	68-7	68-3	68-0
90-6	75-3	74-7	74-3	74-0	73-4	73-0	72-5	72-1	71-6	71-2	70-6	70-3	69-7	69-3	69-0	68-4	68-1
90-7	75-3	75-0	74-4	74-1	73-5	73-1	72-6	72-2	71-6	71-3	70-7	70-3	70-0	69-4	69-1	68-5	68-1

91 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
91-0	90-4	90-1	89-5	89-1	88-6	88-2	87-7	87-3	86-7	86-4	86-0	85-4	85-1	84-5	84-1	83-6
91-1	90-5	90-2	89-6	89-2	88-7	88-3	87-7	87-4	87-0	86-5	86-1	85-5	85-2	84-6	84-2	83-7
91-2	90-6	90-3	89-7	89-3	89-0	88-4	88-0	87-5	87-1	86-6	86-2	85-6	85-3	84-7	84-3	84-0
91-3	90-7	90-4	90-0	89-4	89-1	88-5	88-1	87-6	87-2	86-6	86-3	85-7	85-3	85-0	84-4	84-1
91-4	91-0	90-5	90-1	89-5	89-2	88-6	88-2	87-7	87-3	86-7	86-4	86-0	85-4	85-1	84-5	84-1
91-5	91-1	90-6	90-2	89-6	89-3	88-7	88-3	88-0	87-4	87-0	86-5	86-1	85-5	85-2	84-6	84-2
91-6	91-2	90-7	90-3	89-7	89-4	89-0	88-4	88-1	87-5	87-1	86-6	86-2	85-6	85-3	84-7	84-3
91-7	91-3	91-0	90-4	90-0	89-5	89-1	88-5	88-2	87-6	87-2	86-7	86-3	85-7	85-4	85-0	84-4

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
91-0	83-2	82-6	82-3	81-7	81-4	81-0	80-4	80-1	79-5	79-1	78-6	78-2	77-6	77-3	76-7	76-4	76-0
91-1	83-3	82-7	82-4	82-0	81-4	81-1	80-5	80-2	79-6	79-2	78-7	78-3	77-7	77-4	77-0	76-4	76-1
91-2	83-4	83-0	82-5	82-1	81-5	81-2	80-6	80-2	79-7	79-3	78-7	78-4	78-0	77-5	77-1	76-5	76-2
91-3	83-5	83-1	82-6	82-2	81-6	81-3	80-7	80-3	80-0	79-4	79-0	78-5	78-1	77-5	77-2	76-6	76-2
91-4	83-6	83-2	82-6	82-3	81-7	81-3	81-0	80-4	80-1	79-5	79-1	78-6	78-2	77-6	77-2	76-7	76-3
91-5	83-7	83-3	82-7	82-4	82-0	81-4	81-1	80-5	80-1	79-6	79-2	78-6	78-3	77-7	77-3	77-0	76-4
91-6	84-0	83-4	83-0	82-5	82-1	81-5	81-2	80-6	80-2	79-7	79-3	78-7	78-4	78-0	77-4	77-1	76-5
91-7	84-1	83-5	83-1	82-6	82-2	81-6	81-2	80-7	80-3	79-7	79-4	79-0	78-4	78-1	77-5	77-1	76-6

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
91-0	75-4	75-1	74-5	74-1	73-6	73-2	72-6	72-3	71-7	71-3	71-0	70-4	70-1	69-5	69-1	68-6	68-2
91-1	75-5	75-1	74-6	74-2	73-6	73-3	72-7	72-4	72-0	71-4	71-1	70-5	70-1	69-6	69-2	68-6	68-3
91-2	75-6	75-2	74-7	74-3	73-7	73-4	73-0	72-4	72-1	71-5	71-1	70-6	70-2	69-6	69-3	68-7	68-4
91-3	75-7	75-3	74-7	74-4	74-0	73-4	73-1	72-5	72-1	71-6	71-2	70-7	70-3	69-7	69-4	69-0	68-4
91-4	76-0	75-4	75-0	74-5	74-1	73-5	73-2	72-6	72-2	71-7	71-3	70-7	70-4	70-0	69-4	69-1	68-5
91-5	76-0	75-5	75-1	74-5	74-2	73-6	73-2	72-7	72-3	71-7	71-4	71-0	70-4	70-1	69-5	69-1	68-6
91-6	76-1	75-6	75-2	74-6	74-3	73-7	73-3	73-0	72-4	72-0	71-5	71-1	70-5	70-2	69-6	69-2	68-7
91-7	76-2	75-6	75-3	74-7	74-3	74-0	73-4	73-0	72-5	72-1	71-5	71-2	70-6	70-2	69-7	69-3	68-7

92 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
92-0	91-4	91-1	90-5	90-1	89-6	89-2	88-6	88-3	87-7	87-3	87-0	86-4	86-0	85-4	85-1	84-5
92-1	91-5	91-2	90-6	90-2	89-7	89-3	88-7	88-4	88-0	87-4	87-0	86-5	86-1	85-5	85-2	84-6
92-2	91-6	91-3	90-7	90-3	90-0	89-4	89-0	88-4	88-1	87-5	87-1	86-6	86-2	85-6	85-3	84-7
92-3	91-7	91-4	91-0	90-4	90-1	89-5	89-1	88-5	88-2	87-6	87-2	86-7	86-3	85-7	85-4	85-0
92-4	92-0	91-5	91-1	90-5	90-2	89-6	89-2	88-6	88-3	87-7	87-3	87-0	86-4	86-0	85-5	85-1
92-5	92-1	91-6	91-2	90-6	90-2	89-7	89-3	88-7	88-4	88-0	87-4	87-1	86-5	86-1	85-6	85-2
92-6	92-2	91-7	91-3	90-7	90-3	90-0	89-4	89-0	88-5	88-1	87-5	87-1	86-6	86-2	85-6	85-3
92-7	92-3	92-0	91-4	91-0	90-4	90-1	89-5	89-1	88-6	88-2	87-6	87-2	86-7	86-3	85-7	85-4

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
92-0	84-1	83-6	83-2	82-6	82-3	81-7	81-3	81-0	80-4	80-0	79-5	79-1	78-5	78-2	77-6	77-2	76-7
92-1	84-2	83-7	83-3	82-7	82-4	82-0	81-4	81-1	80-5	80-1	79-6	79-2	78-6	78-2	77-7	77-3	76-7
92-2	84-3	84-0	83-4	83-0	82-5	82-1	81-5	81-1	80-6	80-2	79-6	79-3	78-7	78-3	78-0	77-4	77-0
92-3	84-4	84-0	83-5	83-1	82-5	82-2	81-6	81-2	80-7	80-3	79-7	79-4	79-0	78-4	78-0	77-5	77-1
92-4	84-5	84-1	83-6	83-2	82-6	82-3	81-7	81-3	81-0	80-4	80-0	79-4	79-1	78-5	78-1	77-6	77-2
92-5	84-6	84-2	83-7	83-3	82-7	82-3	82-0	81-4	81-0	80-5	80-1	79-5	79-2	78-6	78-2	77-6	77-3
92-6	84-7	84-3	84-0	83-4	83-0	82-4	82-1	81-5	81-1	80-6	80-2	79-6	79-2	78-7	78-3	77-7	77-4
92-7	85-0	84-4	84-0	83-5	83-1	82-5	82-2	81-6	81-2	80-6	80-3	79-7	79-3	79-0	78-4	78-0	77-4

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
92-0	76-3	75-7	75-4	75-0	74-4	74-0	73-5	73-1	72-5	72-2	71-6	71-2	70-7	70-3	69-7	69-4	69-0
92-1	76-4	76-0	75-4	75-1	74-5	74-1	73-6	73-2	72-6	72-3	71-7	71-3	70-7	70-4	70-0	69-4	69-1
92-2	76-5	76-1	75-5	75-1	74-6	74-2	73-6	73-3	72-7	72-3	72-0	71-4	71-0	70-5	70-1	69-5	69-2
92-3	76-5	76-2	75-6	75-2	74-7	74-3	73-7	73-4	73-0	72-4	72-0	71-5	71-1	70-5	70-2	69-6	69-2
92-4	76-6	76-3	75-7	75-3	74-7	74-4	74-0	73-4	73-1	72-5	72-1	71-6	71-2	70-6	70-2	69-7	69-3
92-5	76-7	76-3	76-0	75-4	75-0	74-5	74-1	73-5	73-1	72-6	72-2	71-6	71-3	70-7	70-3	69-7	69-4
92-6	77-0	76-4	76-0	75-5	75-1	74-5	74-2	73-6	73-2	72-6	72-3	71-7	71-3	71-0	70-4	70-0	69-5
92-7	77-1	76-5	76-1	75-6	75-2	74-6	74-2	73-7	73-3	72-7	72-4	72-0	71-4	71-0	70-5	70-1	69-5

93 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
93-0	92-4	92-1	91-5	91-1	90-5	90-2	89-6	89-2	88-7	88-3	87-7	87-3	87-0	86-4	86-0	85-4
93-1	92-5	92-2	91-6	91-2	90-6	90-3	89-7	89-3	88-7	88-4	88-0	87-4	87-1	86-5	86-1	85-5
93-2	92-6	92-3	91-7	91-3	90-7	90-4	90-0	89-4	89-0	88-5	88-1	87-5	87-1	86-6	86-2	85-6
93-3	92-7	92-4	92-0	91-4	91-0	90-5	90-1	89-5	89-1	88-6	88-2	87-6	87-2	86-7	86-3	85-7
93-4	93-0	92-5	92-1	91-5	91-1	90-6	90-2	89-6	89-2	88-7	88-3	87-7	87-3	87-0	86-4	86-0
93-5	93-1	92-6	92-2	91-6	91-2	90-7	90-3	89-7	89-3	89-0	88-4	88-0	87-4	87-1	86-5	86-1
93-6	93-2	92-7	92-3	91-7	91-3	91-0	90-4	90-0	89-4	89-1	88-5	88-1	87-5	87-2	86-6	86-2
93-7	93-3	92-7	92-4	92-0	91-4	91-0	90-5	90-1	89-5	89-1	88-6	88-2	87-6	87-2	86-7	86-3

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
93-0	85-1	84-5	84-1	83-6	83-2	82-6	82-2	81-7	81-3	80-7	80-4	80-0	79-4	79-0	78-5	78-1	77-5
93-1	85-2	84-6	84-2	83-7	83-3	82-7	82-3	82-0	81-4	81-0	80-4	80-1	79-5	79-1	78-6	78-2	77-6
93-2	85-3	84-7	84-3	83-7	83-4	83-0	82-4	82-0	81-5	81-1	80-5	80-2	79-6	79-2	78-6	78-3	77-7
93-3	85-4	85-0	84-4	84-0	83-5	83-1	82-5	82-1	81-6	81-2	80-6	80-2	79-7	79-3	78-7	78-3	78-0
93-4	85-4	85-1	84-5	84-1	83-5	83-2	82-6	82-2	81-7	81-3	80-7	80-3	80-0	79-4	79-0	78-4	78-1
93-5	85-5	85-2	84-6	84-2	83-6	83-3	82-7	82-3	81-7	81-4	81-0	80-4	80-0	79-5	79-1	78-5	78-1
93-6	85-6	85-3	84-7	84-3	83-7	83-4	83-0	82-4	82-0	81-5	81-1	80-5	80-1	79-6	79-2	78-6	78-2
93-7	85-7	85-3	85-0	84-4	84-0	83-4	83-1	82-5	82-1	81-5	81-2	80-6	80-2	79-6	79-3	78-7	78-3

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
93-0	77-1	76-6	76-2	75-6	75-3	74-7	74-3	73-7	73-4	73-0	72-4	72-1	71-5	71-1	70-6	70-2	69-6
93-1	77-2	76-7	76-3	75-7	75-3	75-0	74-4	74-0	73-5	73-1	72-5	72-1	71-6	71-2	70-6	70-2	69-7
93-2	77-3	76-7	76-4	76-0	75-4	75-1	74-5	74-1	73-5	73-2	72-6	72-2	71-6	71-3	70-7	70-3	70-0
93-3	77-4	77-0	76-5	76-1	75-5	75-1	74-6	74-2	73-6	73-2	72-7	72-3	71-7	71-3	71-0	70-4	70-0
93-4	77-5	77-1	76-5	76-2	75-6	75-2	74-6	74-3	73-7	73-3	72-7	72-4	72-0	71-4	71-0	70-5	70-1
93-5	77-6	77-2	76-6	76-2	75-7	75-3	74-7	74-3	74-0	73-4	73-0	72-4	72-1	71-5	71-1	70-5	70-2
93-6	77-7	77-3	76-7	76-3	76-0	75-4	75-0	74-4	74-1	73-5	73-1	72-5	72-2	71-6	71-2	70-6	70-3
93-7	77-7	77-4	77-0	76-4	76-0	75-5	75-1	74-5	74-1	73-6	73-2	72-6	72-2	71-7	71-3	70-7	70-3

94 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
94-0	93-4	93-0	92-5	92-1	91-5	91-1	90-6	90-2	89-6	89-2	88-7	88-3	87-7	87-3	87-0	86-4
94-1	93-5	93-1	92-6	92-2	91-6	91-2	90-7	90-3	89-7	89-3	89-0	88-4	88-0	87-4	87-1	86-5
94-2	93-6	93-2	92-7	92-3	91-7	91-3	91-0	90-4	90-0	89-4	89-1	88-5	88-1	87-5	87-1	86-6
94-3	93-7	93-3	93-0	92-4	92-0	91-4	91-1	90-5	90-1	89-5	89-1	88-6	88-2	87-6	87-2	86-7
94-4	94-0	93-4	93-1	92-5	92-1	91-5	91-2	90-6	90-2	89-6	89-2	88-7	88-3	87-7	87-3	87-0
94-5	94-1	93-5	93-2	92-6	92-2	91-6	91-3	90-7	90-3	89-7	89-3	89-0	88-4	88-0	87-4	87-0
94-6	94-2	93-6	93-3	92-7	92-3	91-7	91-3	91-0	90-4	90-0	89-4	89-1	88-5	88-1	87-5	87-1
94-7	94-3	93-7	93-4	93-0	92-4	92-0	91-4	91-1	90-5	90-1	89-5	89-1	88-6	88-2	87-6	87-2

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
94-0	86-0	85-4	85-1	84-5	84-1	83-5	83-2	82-6	82-2	81-6	81-2	80-7	80-3	79-7	79-3	79-0	78-4
94-1	86-1	85-5	85-1	84-6	84-2	83-6	83-2	82-7	82-3	81-7	81-3	81-0	80-4	80-0	79-4	79-1	78-5
94-2	86-2	85-6	85-2	84-7	84-3	83-7	83-3	83-0	82-4	82-0	81-4	81-0	80-5	80-1	79-5	79-1	78-6
94-3	86-3	85-7	85-3	85-0	84-4	84-0	83-4	83-0	82-5	82-1	81-5	81-1	80-6	80-2	79-6	79-2	78-6
94-4	86-4	86-0	85-4	85-0	84-5	84-1	83-5	83-1	82-6	82-2	81-6	81-2	80-6	80-3	79-7	79-3	78-7
94-5	86-5	86-1	85-5	85-1	84-6	84-2	83-6	83-2	82-6	82-3	81-7	81-3	80-7	80-3	80-0	79-4	79-0
94-6	86-6	86-2	85-6	85-2	84-6	84-3	83-7	83-3	82-7	82-3	82-0	81-4	81-0	80-4	80-1	79-5	79-1
94-7	86-6	86-3	85-7	85-3	84-7	84-4	84-0	83-4	83-0	82-4	82-1	81-5	81-1	80-5	80-1	79-6	79-2

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
94-0	78-0	77-4	77-1	76-5	76-1	75-5	75-2	74-6	74-2	73-6	73-3	72-7	72-3	71-7	71-4	71-0	70-4
94-1	78-1	77-5	77-1	76-6	76-2	75-6	75-2	74-7	74-3	73-7	73-3	73-0	72-4	72-0	71-4	71-1	70-5
94-2	78-2	77-6	77-2	76-7	76-3	75-7	75-3	74-7	74-4	74-0	73-4	73-0	72-5	72-1	71-5	71-1	70-6
94-3	78-3	77-7	77-3	76-7	76-4	76-0	75-4	75-0	74-4	74-1	74-5	73-1	72-5	72-2	71-6	71-2	70-6
94-4	78-3	78-0	77-4	77-0	76-4	76-1	75-5	75-1	74-5	74-1	73-6	73-2	72-6	72-2	71-7	71-3	70-7
94-5	78-4	78-1	77-5	77-1	76-5	76-1	75-6	75-2	74-6	74-2	73-6	73-3	72-7	72-3	71-7	71-4	71-0
94-6	78-5	78-1	77-6	77-2	76-6	76-2	75-6	75-3	74-7	74-3	73-7	73-3	73-0	72-4	72-0	71-4	71-1
94-7	78-6	78-2	77-6	77-3	76-7	76-3	75-7	75-3	75-0	74-4	74-0	73-4	73-0	72-5	72-1	71-5	71-1

95 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
95-0	94-4	94-0	93-5	93-1	92-5	92-1	91-5	91-2	90-6	90-2	89-6	89-2	88-7	88-3	87-7	87-3
95-1	94-5	94-1	93-6	93-2	92-6	92-2	91-6	91-3	90-7	90-3	89-7	89-3	89-0	88-4	88-0	87-4
95-2	94-6	94-2	93-7	93-3	92-7	92-3	91-7	91-4	91-0	90-4	90-0	89-4	89-0	88-5	88-1	87-5
95-3	94-7	94-3	94-0	93-4	93-0	92-4	92-0	91-4	91-1	90-5	90-1	89-5	89-1	88-6	88-2	87-6
95-4	95-0	94-4	94-1	93-5	93-1	92-5	92-1	91-5	91-2	90-6	90-2	89-6	89-2	88-7	88-3	87-7
95-5	95-1	94-5	94-2	93-6	93-2	92-6	92-2	91-6	91-3	90-7	90-3	89-7	89-3	88-7	88-4	88-0
95-6	95-2	94-6	94-3	93-7	93-3	92-7	92-3	91-7	91-4	91-0	90-4	90-0	89-4	89-0	88-5	88-1
95-7	95-3	94-7	94-3	94-0	93-4	93-0	92-4	92-0	91-4	91-1	90-5	90-1	89-5	89-1	88-5	88-2

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
95-0	86-7	86-4	86-0	85-4	85-0	84-4	84-1	83-5	83-1	82-5	82-1	81-6	81-2	80-6	80-2	79-6	79-3
95-1	87-0	86-5	86-1	85-5	85-1	84-5	84-1	83-6	83-2	82-6	82-2	81-6	81-3	80-7	80-3	79-7	79-3
95-2	87-1	86-5	86-2	85-6	85-2	84-6	84-2	83-7	83-3	82-7	82-3	81-7	81-4	81-0	80-4	80-0	79-4
95-3	87-2	86-6	86-3	85-7	85-3	84-7	84-3	83-7	83-4	83-0	82-4	82-0	81-4	81-1	80-5	80-1	79-5
95-4	87-3	86-7	86-3	86-0	85-4	85-0	84-4	84-0	83-5	83-1	82-5	82-1	81-5	81-1	80-6	80-2	79-6
95-5	87-4	87-0	86-4	86-1	85-5	85-1	84-5	84-1	83-5	83-2	82-6	82-2	81-6	81-2	80-6	80-3	79-7
95-6	87-5	87-1	86-5	86-1	85-6	85-2	84-6	84-2	83-6	83-2	82-7	82-3	81-7	81-3	80-7	80-3	80-0
95-7	87-6	87-2	86-6	86-2	85-6	85-3	84-7	84-3	83-7	83-3	82-7	82-4	82-0	81-4	81-0	80-4	80-0

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
95-0	78-7	78-3	77-7	77-3	77-0	76-4	76-0	75-4	75-0	74-5	74-1	73-5	73-1	72-5	72-2	71-6	71-2
95-1	79-0	78-4	78-0	77-4	77-0	76-5	76-1	75-5	75-1	74-5	74-2	73-6	73-2	72-6	72-2	71-7	71-3
95-2	79-0	78-5	78-1	77-5	77-1	76-5	76-2	75-6	75-2	74-6	74-2	73-7	73-3	72-7	72-3	71-7	71-4
95-3	79-1	78-5	78-2	77-6	77-2	76-6	76-2	75-7	75-3	74-7	74-3	73-7	73-4	73-0	72-4	72-0	71-4
95-4	79-2	78-6	78-2	77-7	77-3	76-7	76-3	75-7	75-4	75-0	74-4	74-0	73-4	73-0	72-5	72-1	71-5
95-5	79-3	78-7	78-3	77-7	77-4	77-0	76-4	76-0	75-4	75-1	74-5	74-1	73-5	73-1	72-5	72-2	71-6
95-6	79-4	79-0	78-4	78-0	77-4	77-1	76-5	76-1	75-5	75-1	74-5	74-2	73-6	73-2	72-6	72-2	71-7
95-7	79-5	79-1	78-5	78-1	77-5	77-1	76-6	76-2	75-6	75-2	74-6	74-2	73-7	73-3	72-7	72-3	71-7

96 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
96-0	95-4	95-0	94-4	94-1	93-5	93-1	92-5	92-1	91-5	91-2	90-6	90-2	89-6	89-2	88-6	88-3
96-1	95-5	95-1	94-5	94-2	93-6	93-2	92-6	92-2	91-6	91-3	90-7	90-3	89-7	89-3	88-7	88-3
96-2	95-6	95-2	94-6	94-3	93-7	93-3	92-7	92-3	91-7	91-4	91-0	90-4	90-0	89-4	89-0	88-4
96-3	95-7	95-3	94-7	94-4	94-0	93-4	93-0	92-4	92-0	91-4	91-1	90-5	90-1	89-5	89-1	88-5
96-4	96-0	95-4	95-0	94-5	94-1	93-5	93-1	92-5	92-1	91-5	91-2	90-6	90-2	89-6	89-2	88-6
96-5	96-1	95-5	95-1	94-6	94-2	93-6	93-2	92-6	92-2	91-6	91-2	90-7	90-3	89-7	89-3	88-7
96-6	96-2	95-6	95-2	94-7	94-3	93-7	93-3	92-7	92-3	91-7	91-3	91-0	90-4	90-0	89-4	89-0
96-7	96-3	95-7	95-3	95-0	94-4	94-0	93-4	93-0	92-4	92-0	91-4	91-1	90-5	90-1	89-5	89-1

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
96-0	87-7	87-3	86-7	86-3	85-7	85-4	85-0	84-4	84-0	83-4	83-0	82-4	82-1	81-5	81-1	80-5	80-1
96-1	88-0	87-4	87-0	86-4	86-0	85-4	85-1	84-5	84-1	83-5	83-1	82-5	82-1	81-6	81-2	80-6	80-2
96-2	88-1	87-5	87-1	86-5	86-1	85-5	85-1	84-6	84-2	83-6	83-2	82-6	82-2	81-7	81-3	80-7	80-3
96-3	88-1	87-6	87-2	86-6	86-2	85-6	85-2	84-6	84-3	83-7	83-3	82-7	82-3	81-7	81-3	81-0	80-4
96-4	88-2	87-7	87-3	86-7	86-3	85-7	85-3	84-7	84-4	84-0	83-4	83-0	82-4	82-0	81-4	81-0	80-5
96-5	88-3	87-7	87-4	87-0	86-4	86-0	85-4	85-0	84-4	84-1	83-5	83-1	82-5	82-1	81-5	81-1	80-5
96-6	88-4	88-0	87-4	87-1	86-5	86-1	85-5	85-1	84-5	84-1	83-6	83-2	82-6	82-2	81-6	81-2	80-6
96-7	88-5	88-1	87-5	87-2	86-6	86-2	85-6	85-2	84-6	84-2	83-6	83-3	82-7	82-3	81-7	81-3	80-7

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
96-0	79-5	79-2	78-6	78-2	77-6	77-2	76-6	76-3	75-7	75-3	74-7	74-3	73-7	73-4	73-0	72-4	72-0
96-1	79-6	79-2	78-7	78-3	77-7	77-3	76-7	76-3	76-0	75-4	75-0	74-4	74-0	73-4	73-0	72-5	72-1
96-2	79-7	79-3	78-7	78-4	78-0	77-4	77-0	76-4	76-0	75-4	75-1	74-5	74-1	73-5	73-1	72-5	72-2
96-3	80-0	79-4	79-0	78-4	78-1	77-5	77-1	76-5	76-1	75-5	75-1	74-6	74-2	73-6	73-2	72-6	72-2
96-4	80-1	79-5	79-1	78-5	78-1	77-6	77-2	76-6	76-2	75-6	75-2	74-6	74-2	73-7	73-3	72-7	72-3
96-5	80-2	79-6	79-2	78-6	78-2	77-6	77-2	76-7	76-3	75-7	75-3	74-7	74-3	73-7	73-3	73-0	72-4
96-6	80-2	79-7	79-3	78-7	78-3	77-7	77-3	76-7	76-3	76-0	75-4	75-0	74-4	74-0	73-4	73-0	72-5
96-7	80-3	79-7	79-4	79-0	78-4	78-0	77-4	77-0	76-4	76-0	75-5	75-1	74-5	74-1	73-5	73-1	72-5

97 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
97-0	96-4	96-0	95-4	95-0	94-5	94-1	93-5	93-1	92-5	92-1	91-5	91-1	90-6	90-2	89-6	89-2
97-1	96-5	96-1	95-5	95-1	94-6	94-2	93-6	93-2	92-6	92-2	91-6	91-2	90-6	90-3	89-7	89-3
97-2	96-6	96-2	95-6	95-2	94-7	94-3	93-7	93-3	92-7	92-3	91-7	91-3	90-7	90-4	90-0	89-4
97-3	96-7	96-3	95-7	95-3	95-0	94-4	94-0	93-4	93-0	92-4	92-0	91-4	91-0	90-4	90-1	89-5
97-4	97-0	96-4	96-0	95-4	95-1	94-5	94-1	93-5	93-1	92-5	92-1	91-5	91-1	90-5	90-2	89-6
97-5	97-1	96-5	96-1	95-5	95-1	94-6	94-2	93-6	93-2	92-6	92-2	91-6	91-2	90-6	90-2	89-7
97-6	97-2	96-6	96-2	95-6	95-2	94-7	94-3	93-7	93-3	92-7	92-3	91-7	91-3	90-7	90-3	89-7
97-7	97-3	96-7	96-3	95-7	95-3	95-0	94-4	94-0	93-4	93-0	92-4	92-0	91-4	91-0	90-4	90-0

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16	16½%
97-0	88-6	88-2	87-6	87-2	86-7	86-3	85-7	85-3	84-7	84-3	83-7	83-3	82-7	82-4	82-0	81-4	81-0
97-1	88-7	88-3	87-7	87-3	86-7	86-4	86-0	85-4	85-0	84-4	84-0	83-4	83-0	82-4	82-1	81-5	81-1
97-2	89-0	88-4	88-0	87-4	87-0	86-4	86-1	85-5	85-1	84-5	84-1	83-5	83-1	82-5	82-1	81-6	81-2
97-3	89-1	88-5	88-1	87-5	87-1	86-5	86-1	85-6	85-2	84-6	84-2	83-6	83-2	82-6	82-2	82-6	81-2
97-4	89-2	88-6	88-2	87-6	87-2	86-6	86-2	85-6	85-3	84-7	84-3	83-7	83-3	82-7	82-3	81-7	81-3
97-5	89-3	88-7	88-3	87-7	87-3	86-7	86-3	85-7	85-3	84-7	84-4	84-0	83-4	83-0	82-4	82-0	81-4
97-6	89-4	89-0	88-4	88-0	87-4	87-0	86-4	86-0	85-4	85-0	84-4	84-1	83-5	83-1	82-5	82-1	81-5
97-7	89-4	89-1	88-5	88-1	87-5	87-1	86-5	86-1	85-5	85-1	84-5	84-1	83-5	83-2	82-6	82-2	81-6

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
97-0	80-4	80-0	79-4	79-0	78-5	78-1	77-5	77-1	76-5	76-1	75-5	75-1	74-6	74-2	73-6	73-2	72-6
97-1	80-5	80-1	79-5	79-1	78-5	78-1	77-6	77-2	76-6	76-2	75-6	75-2	74-6	74-2	73-7	73-3	72-7
97-2	80-6	80-2	79-6	79-2	78-6	78-2	77-6	77-3	76-7	76-3	75-7	75-3	74-7	74-3	73-7	73-3	73-0
97-3	80-7	80-3	79-7	79-3	78-7	78-3	77-7	77-3	76-7	76-4	76-0	75-4	75-0	74-4	74-0	73-4	73-0
97-4	80-7	80-4	80-0	79-4	79-0	78-4	78-0	77-4	77-0	76-4	76-0	75-5	75-1	74-5	74-1	73-5	73-1
97-5	81-0	80-4	80-0	79-5	79-1	78-5	78-1	77-5	77-1	76-5	76-1	75-5	75-1	74-5	74-2	73-6	73-2
97-6	81-1	80-5	80-1	79-5	79-1	78-6	78-2	77-6	77-2	76-6	76-2	75-6	75-2	74-6	74-2	73-6	73-3
97-7	81-2	80-6	80-2	79-6	79-2	78-6	78-2	77-6	77-3	76-7	76-3	75-7	75-3	74-7	74-3	73-7	73-3

98 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
98-0	97-4	97-0	96-4	96-0	95-4	95-0	94-5	94-1	93-5	93-1	92-5	92-1	91-5	91-1	90-5	90-1
98-1	97-5	97-1	96-5	96-1	95-5	95-1	94-6	94-2	93-6	93-2	92-6	92-2	91-6	91-2	90-6	90-2
98-2	97-6	97-2	96-6	96-2	95-6	95-2	94-6	94-3	93-7	93-3	92-7	92-3	91-7	91-3	90-7	90-3
98-3	97-7	97-3	96-7	96-3	95-7	95-3	94-7	94-4	94-0	93-4	93-0	92-4	92-0	91-4	91-0	90-4
98-4	98-0	97-4	97-0	96-4	96-0	95-4	95-0	94-4	94-1	93-5	93-1	92-5	92-1	91-5	91-1	90-5
98-5	98-1	97-5	97-1	96-5	96-1	95-5	95-1	94-5	94-1	93-6	93-2	92-6	92-2	91-6	91-2	90-6
98-6	98-2	97-6	97-2	96-6	96-2	95-6	95-2	94-6	94-2	93-7	93-3	92-7	92-3	91-7	91-3	90-7
98-7	98-3	97-7	97-3	96-7	96-3	95-7	95-3	94-7	94-3	93-7	93-3	93-0	92-4	92-0	91-4	91-0

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
98-0	89-5	89-1	88-6	88-2	87-6	87-2	86-6	86-2	85-6	85-2	84-6	84-2	83-6	83-2	82-6	82-3	81-7
98-1	89-6	89-2	88-6	88-3	87-7	87-3	86-7	86-3	85-7	85-3	84-7	84-3	83-7	83-3	82-7	82-3	81-7
98-2	89-7	89-3	88-7	88-3	87-7	87-4	87-0	86-4	86-0	85-4	85-0	84-4	84-0	83-4	83-0	82-4	82-0
98-3	90-0	89-4	89-0	88-4	88-0	87-4	87-0	86-5	86-1	85-5	85-1	84-5	84-1	83-5	83-1	82-5	82-1
98-4	90-1	89-5	89-1	88-5	88-1	87-5	87-1	86-5	86-2	85-6	85-2	84-6	84-2	83-6	83-2	82-6	82-2
98-5	90-2	89-6	89-2	88-6	88-2	87-6	87-2	86-6	86-2	85-6	85-2	84-7	84-3	83-7	83-3	82-7	82-3
98-6	90-3	89-7	89-3	88-7	88-3	87-7	87-3	86-7	86-3	85-7	85-3	84-7	84-3	84-0	83-4	83-0	82-4
98-7	90-4	90-0	89-4	89-0	88-4	88-0	87-4	87-0	86-4	86-0	85-4	85-0	84-4	84-0	83-4	83-0	82-4

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
98-0	81-3	80-7	80-3	79-7	79-3	78-7	78-3	77-7	77-3	76-7	76-4	76-0	75-4	75-0	74-4	74-0	73-4
98-1	81-4	81-0	80-4	80-0	79-4	79-0	78-4	78-0	77-4	77-0	76-4	76-0	75-4	75-1	74-5	74-1	73-5
98-2	81-4	81-0	80-5	80-1	79-5	79-1	78-5	78-1	77-5	77-1	76-5	76-1	75-5	75-1	74-5	74-1	73-6
98-3	81-5	81-1	80-5	80-1	79-5	79-2	78-6	78-2	77-6	77-2	76-6	76-2	75-6	75-2	74-6	74-2	73-6
98-4	81-6	81-2	80-6	80-2	79-6	79-2	78-6	78-2	77-7	77-3	76-7	76-3	75-7	75-3	74-7	74-3	73-7
98-5	81-7	81-3	80-7	80-3	79-7	79-3	78-7	78-3	77-7	77-3	76-7	76-3	76-0	75-4	75-0	71-4	74-0
98-6	82-0	81-4	81-0	80-4	80-0	79-4	79-0	78-4	78-0	77-4	77-0	76-4	76-0	75-4	75-0	74-4	74-1
98-7	82-1	81-5	81-1	80-5	80-1	79-5	79-1	78-5	78-1	77-5	77-1	76-5	76-1	75-5	75-1	74-5	74-1

99 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
99-0	98-4	98-0	97-4	97-0	96-4	96-0	95-4	95-0	94-4	94-0	93-4	93-0	92-5	92-1	91-5	91-1
99-1	98-5	98-1	87-5	97-1	96-5	96-1	95-5	95-1	94-5	64-1	93-5	93-1	92-5	92-1	91-6	91-2
99-2	98-6	98-2	97-6	97-2	96-6	96-2	95-6	95-2	94-6	94-2	93-6	93-2	92-6	92-2	91-6	91-2
99-3	98-7	98-3	97-7	97-3	96-7	96-3	95-7	95-3	94-7	94-3	93-7	93-3	92-7	92-3	91-7	91-3
99-4	99-0	98-4	98-0	97-4	97-0	96-4	96-0	95-4	95-0	94-4	94-0	93-4	93-0	92-4	92-0	91-4
99-5	99-1	98-5	98-1	97-5	97-1	96-5	96-1	95-5	95-1	94-5	94-1	93-5	93-1	92-5	92-1	91-5
99-6	99-2	98-6	98-2	97-6	97-2	96-6	96-2	95-6	95-2	94-6	94-2	93-6	93-2	92-6	92-2	91-6
99-7	99-3	98-7	98-3	97-7	97-3	96-7	96-3	95-7	95-3	94-7	94-3	93-7	93-3	92-7	92-3	91-7

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
99-0	90-5	90-1	89-5	89-1	88-5	88-1	87-5	87-1	86-5	86-1	85-5	85-1	84-5	84-1	83-5	83-1	82-5
99-1	90-6	90-2	89-6	89-2	88-6	88-2	87-6	87-2	86-6	86-2	85-6	85-2	84-6	84-1	83-6	83-2	82-6
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99-7	91-3	90-7	90-3	89-7	89-3	88-7	88-3	87-7	87-3	86-7	86-3	85-7	85-3	84-7	84-3	83-7	83-3

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
99-0	82-1	81-5	81-1	80-5	80-2	79-6	79-2	78-6	78-2	77-6	77-2	76-6	76-2	75-6	75-2	74-6	74-2
99-1	82-2	81-6	81-2	80-6	80-2	79-6	79-2	78-6	78-2	77-7	77-3	76-7	76-3	75-7	75-3	74-7	74-3
99-2	82-3	81-7	81-3	80-7	80-3	79-7	79-3	78-7	78-3	77-7	77-3	76-7	76-3	75-7	75-3	74-7	74-4
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99-4	82-5	82-1	81-5	81-1	80-5	80-1	79-5	79-1	78-5	78-1	77-5	77-1	76-5	76-1	75-5	75-1	74-5
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99-7	82-7	82-3	81-7	81-3	80-7	80-3	79-7	79-3	78-7	78-3	77-7	77-3	76-7	76-3	75-7	75-3	74-7

100 Yd

Yd.	½%	1%	1½%	2%	2½%	3%	3½%	4%	4½%	5%	5½%	6%	6½%	7%	7½%	8%
100-0	99-4	99-0	98-4	98-0	97-4	97-0	96-4	96-0	95-4	95-0	94-4	94-0	93-4	93-0	92-4	92-0
100-1	99-5	99-1	98-5	98-1	97-5	97-1	96-5	96-1	95-5	95-1	94-5	94-1	93-5	93-1	92-5	92-1
100-2	99-6	99-2	98-6	98-2	97-6	97-2	96-6	96-2	95-6	95-2	94-6	94-2	93-6	93-2	92-6	92-2
100-3	99-7	99-3	98-7	98-3	97-7	97-3	96-7	96-3	95-7	95-3	94-7	94-3	93-7	93-3	92-7	92-3
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100-5	100-1	99-5	99-1	98-5	98-1	97-5	97-1	96-5	96-1	95-5	95-1	94-5	94-1	93-5	93-1	92-5
100-6	100-2	99-6	99-2	98-6	98-2	97-6	97-2	96-6	96-2	95-6	95-2	94-6	94-2	93-6	93-2	92-6
100-7	100-3	99-7	99-3	98-7	98-3	97-7	97-3	96-7	96-3	95-7	95-3	94-7	94-3	93-7	93-2	92-6

Yd.	8½%	9%	9½%	10%	10½%	11%	11½%	12%	12½%	13%	13½%	14%	14½%	15%	15½%	16%	16½%
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100-5	92-1	91-5	91-1	90-5	90-0	89-4	89-0	88-4	88-0	87-4	87-0	86-4	86-0	85-4	85-0	84-4	84-0
100-6	92-1	91-5	91-1	90-5	90-1	89-5	89-1	88-5	88-1	87-5	87-1	86-5	86-1	85-5	85-1	84-5	84-1
100-7	92-2	91-6	91-2	90-6	90-2	89-6	89-2	88-6	88-2	87-6	87-2	86-6	86-2	85-6	85-2	84-6	84-2

Yd.	17%	17½%	18%	18½%	19%	19½%	20%	20½%	21%	21½%	22%	22½%	23%	23½%	24%	24½%	25%
100-0	83-0	82-4	82-0	81-4	81-0	80-4	80-0	79-4	79-0	78-4	78-0	77-4	77-0	76-4	76-0	75-4	75-0
100-1	83-1	82-5	82-1	81-5	81-1	80-5	80-1	79-5	79-1	78-5	78-1	77-5	77-1	76-5	76-1	75-5	75-1
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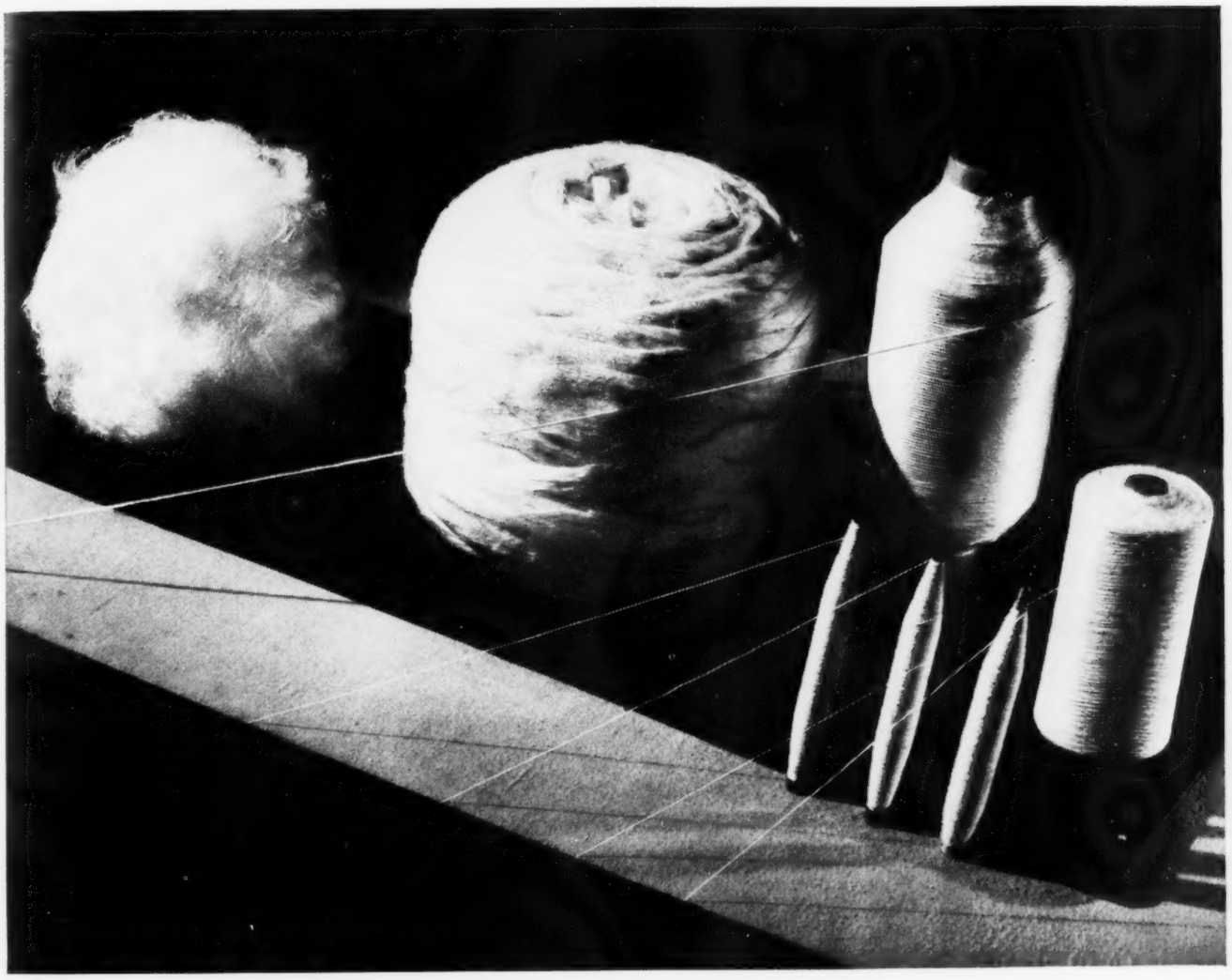
100-3	83-3	82-6	82-2	81-6	81-2	80-6	80-2	79-6	79-2	78-6	78-2	77-6	77-2	76-6	76-2	75-6	75-2
100-4	83-3	82-7	82-3	81-7	81-3	80-7	80-3	79-7	79-3	78-7	78-3	77-7	77-3	76-7	76-3	75-7	75-3
100-5	83-4	83-0	82-4	82-0	81-4	81-0	80-4	80-0	79-4	79-0	78-4	78-0	77-4	77-0	76-4	76-0	75-4
100-6	83-5	83-1	82-5	82-1	81-5	81-1	80-5	80-1	79-5	79-1	78-5	78-1	77-5	77-1	76-5	76-1	75-5
100-7	83-6	83-2	82-6	82-2	81-6	81-2	80-6	80-2	79-6	79-1	78-5	78-1	77-5	77-1	76-5	76-1	75-5

Eastman Acetate Staple

IS THE TALK OF THE TEXTILE INDUSTRY



TEXTILE MEN are excited about the tremendous possibilities of Eastman acetate staple for the weaving of new fabrics, the setting of new styles. Used alone, it results in lovely fabrics of unusual appearance and hand. Blended or combined with other fibers, it produces textures as soft as camel's hair, as firm as worsted, as rough as tweed.

Eastman acetate staple is made of pure cellulose acetate under laboratory control and is scientifically uniform. It is supplied in any length from ¾ to 9 inches, in 3, 4, 5, 8, 12, 16 and 20 denier, comes bright or dull, and may be used on any spinning system—cotton, silk, wool or worsted.

Has your mill investigated Eastman staple? For information consult A. M. Tenney Associates, Inc., 171 Madison Ave., N.Y.C. Sales representatives for Tennessee Eastman Corporation, subsidiary of Eastman Kodak Company.

IF IT ISN'T A VAN VLAANDEREN

–It's *not* a *tensionless* jig

–It's *not* a *constant speed* jig

FOR ACETATES AND OTHER HARD-TO-DYE FABRICS

This new Van Vlaanderen Jig does a near-perfect dyeing job. Both rolls are *driven*—the slack that the operator allows cannot vary. Constant cloth speed is maintained —every yard of every piece being dyed, remains in the bath the same amount of time.

This jig meets the highest standards for sturdy construction and simplicity of operation. Brakes do not have to be set for tension at the end of each run.

When the need for a tensionless, constant-speed dye jig was first apparent, Van Vlaanderen engineers set out to produce a jig that was *really tensionless* and that was really constant speed. This jig has been sold extensively to large modern plants and has proved itself under actual working conditions. As a further development, you can secure this jig with the

NEW LARGE BATCH ROLLS

with diameters of thirteen and one-half inches or eighteen inches, instead of the regular seven and one-half inch rolls. Larger rolls were not needed to reduce tension or to make the speed more constant. The jig was already tensionless and constant speed before the larger rolls were available. In fact, larger rolls cannot make a jig tensionless or constant speed. However, large rolls have two distinct values. Troublesome wrinkles are done away with when the first yards of the batch are wound on the batch rolls. Also goods with heavy selvedges can be handled successfully. On the old type jig with smaller rolls, excessive tension was necessary to secure even build-up of the selvedges. This often caused scalloped selvedges on the finished goods.

By using our automatic stopping and reversing equipment, one operator can tend more machines and there is no danger of missing an end.

Write for full data and prices on this jig

We also manufacture a full line of Standard Type Jigs.

VAN VLAANDEREN MACHINE CO. INCORPORATED

370 STRAIGHT ST., PATERSON, NEW JERSEY

World's largest manufacturers of silk and rayon processing machinery

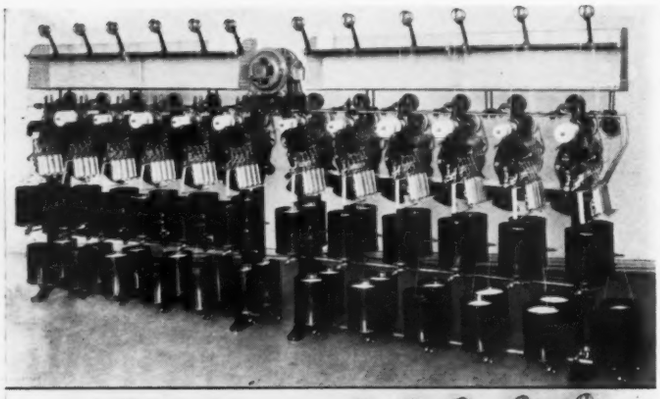
"Go take a rest until next pattern change, Mac.
We're running Dixie durene now."

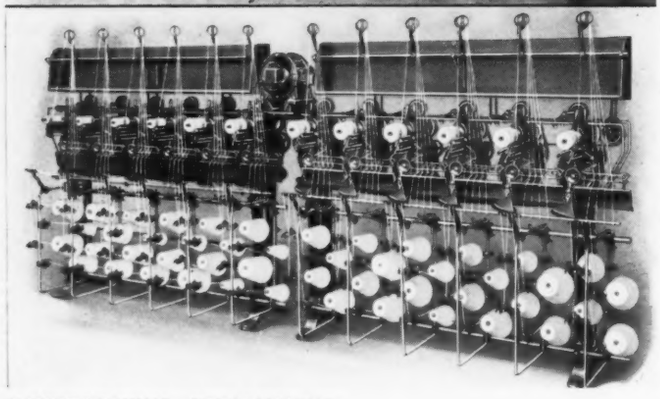
DIXIE DURENE . . . A PRODUCT OF CONTROLLED MANUFACTURE

Dixie **MERCERIZING COMPANY, Chattanooga, Tenn.**

GETTING THE MOST FROM WINDING

Information about winding designed to show improvements in winding equipment and new ideas in the winding operation





MULTIPLE-END WINDING

The No. 50 Leesona Winder can be equipped with attachments for winding up to 30 ends in perfect tape form.

When winding up to four ends — especially coarser counts of yarn — it is preferable to use the can supply pictured above. The cans keep the packages separated and prevent the ends from touching as the heavy yarn balloons between supply and tension. The Universal package so produced is usually used as a supply for braiding machines.

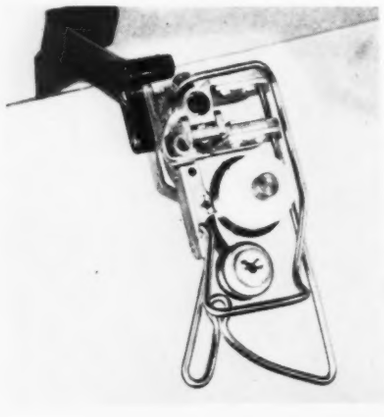
With this supply attachment, the differential tension mechanism is used. When winding full-size packages, this compensates for the variation in yarn speed as the diameter of the winding package builds up.

When winding finer counts, especially small packages of insulating yarns and covering for rubber thread, it is not necessary to have the differential tension. A creel underneath the winding spindles is used to hold the supply packages, and there is a special creel tension for each end. (See illustration below.) This creel can be arranged to hold up to 30 ends for each winding spindle.

Recently there has been an increase in the amount of interest in multiple-end winding of all textile fibers. Our bulletin on the No. 50 Leesona Winder for Sales Yarn illustrates a number of the various multiple-end attachments.

REVERSE-WIND ATTACHMENT

The spindle on the No. 90 Leesona Winder revolves normally in a clockwise direction. When it becomes necessary to wind bobbins in the opposite direction, the reverse-wind attachment is used to reverse the direction of the spindle, causing it to revolve counter-clock-wise.



It is most important for S or Z twist yarns of any textile fiber, to wind them on a spindle revolving in the proper direction — so that when the yarn is drawn off the bobbin in the shuttle, it will be easier to get uniform tension and there will be less chance for the yarn to kink.

Further facts on the No. 90 Winder are contained in Bulletin 101.

PARAFFIN ATTACHMENT FOR ROTO-CONER

At the present time there is an increasing demand from knitters for waxed yarn.

A new combination tension and paraffin disc has been designed for the Roto-Coner which makes it possible to wax the yarn while winding. The illustration shows one application, using the double slub catcher. (The MacColl, or needle-type slub catcher, comes first; then the blade slub catcher.) There is another standard bracket having the single blade-type slub catcher.

For further information about the new Roto-Coner, refer to Bulletin 144.

"THERE'S A UNIVERSAL WINDER FOR EVERY TEXTILE NEED"

UNIVERSAL WINDING COMPANY

BOSTON - NEW YORK - UTICA - CHARLOTTE - ATLANTA - PROVIDENCE

The Overseers Corner

Harriman Harmony

THE little town of Harriman, Tenn., which became world-famous in NRA days when merchants tore down their Blue Eagles, is all "keyed up" to a new idea in harmony. Another "high note" has been struck in relationship between a genial mill management and the thousand workers on the payroll, and a new "pitch" in interest in a wholesome recreational experiment has been reached. It is all said to be due to a mill-chapel community-singing class organized more than a year ago by 85 mill workers, officials, their relatives and friends. This group began holding regular singings in an empty building near the mill. Soon so much interest was evident that Tom Tarwater, affable president of the mill and a member of the class, announced that a public singing would be given as an experiment to determine if the people in general appreciated the efforts of the group. If so, another singing would be arranged.

Early on the evening selected, people on the streets were greeted with, "This is Station HHM broadcasting from the front porch of Harriman Hosiery Mills, and inviting you and your friends to attend the community singing at the mill tonight." By 6 o'clock several hundred persons had gathered on the mill lawn, and by 7 o'clock it was conservatively estimated that more than 3,000 were attentively listening to community songs, solos, quartets and musical numbers. They stayed until the late hours.

Before the crowd gathered, C. C. Walters installed a loud-speaker system that made the program audible all over that section of the town. Two loud speakers were placed on top of the mill. Among the participants in the singing were business men, professional men, laborers, and their respective families. Many declared it was one of the "biggest get-together and rub-elbow crowds that had assembled in Harriman in a long time." Inhabitants of the town pushed into the mill campus until it was full, then filled the driveway and walkways. Hundreds stayed in their automobiles and listened. Cars were parked in the streets for several blocks in every direction.

Tom Graves, looper-room foreman, leader of the singing class, received considerable praise for his part in the success of the occasion. Mr. Tarwater, himself, is an enthusiastic member of the class and takes an active part in the singing. He announced that another such singing would be arranged soon.

Students of industrial relations are interested in the Harriman idea in industrial relations, which seems to have its practical side and which might be helpful in other communities.

A small section of the crowd which turned out for the singing at Harriman.

A quartette at the Harriman community singing. In it are, left to right: John R. Davis, basso, proprietor of Harriman Laundry; D. G. Cole, baritone, repeaterman of American Telephone and Telegraph Co.; J. D. Christmas, first tenor, president and general manager of Christmas Lumber Co., and Tom Tarwater, second tenor, president of Harriman Hosiery Mills and Mrs. John R. Davis is at the piano.

More About Recognition

Editor, Overseer's Corner:

Bill really has something on the ball this time. I am a firm believer in recognizing faithful service and rewarding loyalty to the company. If industry would take a little more interest along this line, there would not be so much fertile ground for radical labor agitators.

I am inclined to think that it would be practical to have a button say for ten years faithful service and then a different one for each additional five years service. This would naturally make the employee feel proud of his connection with the company and will be an inspiration to younger employees who will wish to achieve the same distinction. The personal equation is entering more and more into industry, and anything that will make the employee have a kindlier feeling toward his employer is worthy of a trial.

K.M.S.

CONTRIBUTIONS *to "The Overseers' Corner" are paid for without regard to length. We will use letters discussing the narrative on this page or any other pertinent matter whether of mechanical, managerial or just plain human interest. Those who contribute kinks or practical helps will be paid additional for an appropriate sketch to illustrate their device. It is not necessary to submit finished drawings. If these pages interest you—contribute something to them to interest others. Address Editor, Overseers' Corner, Textile World, 330 West 42d St., New York, N. Y.*

The Overseer's Corner

Vocational Experiment

Meeting with success at West Point

THE TEXTILE industry of the Chattahoochee Valley, in Alabama and Georgia, will in the future have a reservoir of trained young men from whom to select operating executives as result of an experiment in vocational education which has been going forward there for some time and which is now beginning to bear fruit. The work is being carried out jointly by West Point Mfg. Co. and the Alabama State Department of Vocational Education. The Department of Education is furnishing teachers, funds and organization, and West Point has offered its mills and shops as a laboratory for practical instruction. The first class of twelve boys graduated in May, 1937.

Organization and development of this program came about through the realization that ordinarily academic high-school courses do not fit a student for entering a gainful occupation. "Training for the job" has heretofore been left largely to industry itself. Seeking to remedy this situation, the Department of Education is now offering a two-year course (twenty months) in textiles as part of the curriculum of the high schools at Lanett, Shawmut, Fairfax, Langdale and Riverview. The course consists of two hours in textiles (related subjects) and three hours of laboratory work each day on the machine being studied. Two units toward graduation are given for this work, and colleges accept same as credit toward admission.

The boys taking the textile course are selected from the upper half of their respective classes and have to express an intention of making textiles their life work. Teachers must be college graduates who have majored in textiles and who have had at least two years' practical mill experience. Laboratory work in the mill is under the supervision of regular overseers, second hands and skilled operatives. Courses include carding, spinning, weaving and elementary designing. Texts used are as follows: I.C.S. series, "Cotton Mill Processes and Calculations" by Clark, "Practical Loom Fixing" by Nelson, trade journals, such as TEXTILE WORLD, *Colton, Textile Bulletin*, etc., and house organs of machinery manufacturers.

The idea for the vocational system grew in the mind of E. R. Plowden, State Supervisor of Trades and Industries, following a study of the Federal Apprenticeship System. P. C. Ramsay is supervisor of the training in the Chattahoochee Valley. The plan is part of the Alabama Diversified Occupational Program.

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Overseers' Practical Helps

Preventing Transfer Points From Rusting

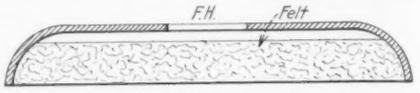
When the first knitting machine to knit the whole sock complete with ribbed top was first placed on the market, there appeared in TEXTILE WORLD an advertisement with the caption, "Goodbye Skilled Topper." Today, nearly 30 years later, we still have the skilled topper with us, and there is still plenty for him (or her) to do. As most of us know, the points on the topper's transfer ring must be kept straight, in a perfect circle, and free from rust. This involves more work than one not familiar with the older method of knitting socks would suppose.

Not infrequently the transfer points rust due to damp weather and/or perspiration from the operative. Formerly, we had our toppers cover the points with two rib tops at the end of the day and on week ends. Also, when a transfer ring was not to be used for some time, the points were dipped in oil and a piece of ribbed fabric placed around them. This method is very effective in preventing rust if properly done, but there is always the human element with which to contend. For example, in our plant the knitters, being more or less excited and in a hurry at quitting time, would often fail to cover their points adequately or forget to cover them at all. Oiling and wrapping of points on transfers to be stored were often neglected as being "too much trouble." So, in an effort to eliminate such problems, one of our fixers designed a durable cover that could be put on in a second's time.

This cover is a shallow cup-shaped device made of hard fiber, as shown in the diagram. It is designed to fit the contour of the points, but is slightly larger in diameter to accommodate a felt ring about ¾ in. wide. This felt ring does the trick—it absorbs any moisture that may collect on the points when they are not being used. The hole in the top, marked F.H., is for lifting the cover on or off and for hanging it up when desired.

These cover-caps are now furnished by manufacturers of fiber roving cans and other receptacles; and, if not abused, they should last for years. Only a moment is required for the knitter to place them on the ring at the end of the day. And, last but not least, these covers save the time and trouble of oiling and wrapping the points when transfer rings are laid away for future use.

I. C. MOORE



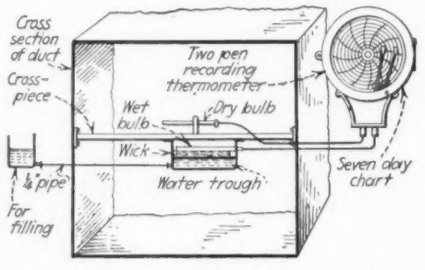
Cover for Transfer Points

Outside-Air Thermometer in Intake Duct

The frequent determination of temperature and humidity is an important factor in the efficient operation of heating plants and air-conditioning equipment. In industrial plants where large quantities of internal-heat emission must be absorbed by the conditioned air, a comparison of outside conditions with those inside is the only reliable guide governing the relation between the quantities of outside air and recirculated air necessary for best economy.

A problem confronting many engineers is where to place the temperature-responsive elements of the instruments used to determine outside air conditions so that their indications will be reasonably accurate. If located on the walls of the building, heat radiation through the walls in winter and reflected heat in summer cause errors. When placed away from the building, inaccessibility in winter and difficulty of neutralizing sun effect in summer must be taken into consideration. Where a wet-bulb thermometer is used in conjunction with a dry-bulb thermometer to determine relative humidity, some method of circulating air at high velocity across the wick of the wet bulb is desirable.

In a large rayon plant this problem



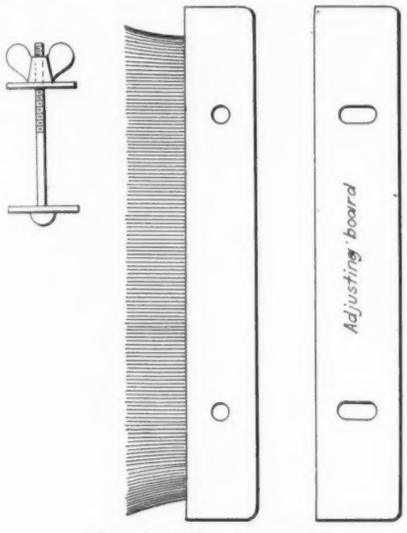
Outside-air thermometer in intake-duct

was solved by placing the temperature-responsive elements within the outside air-intake duct of the conditioner. As shown in the sketch, a two-pen recording thermometer with a seven-day chart furnishes a permanent record.

S. H. COLEMAN

Cleaning Travelers

The continual passing of yarn through the traveler at high speeds, coupled with long-draft spinning and present-day methods of cleaning with air hose, creates much worry for overseers due to travelers loading with lint and causing high end breakage. Not only is end breakage greater, but it also takes spinners longer to piece an end when they have to clean waste from the traveler. Clearers should be set as closely to the traveler as possible without interfering with its operation. Yet for best-running spinning, we cannot depend entirely on the pin or other types



Traveler Cleaning Brush

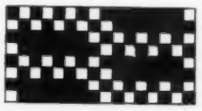
of clearers attached to the ring. For example, in a large mill of 100,000 spindles, there is always the possibility of many traveler clearers being bent away from the ring. Often these are not adjusted until the frame is overhauled, which means that they may remain out of adjustment for quite a long time if the frame is overhauled according to a regular schedule. However, a cleaning brush, made as described and used after frames are cleaned with the hose (or at least once a day), will reduce end breakage considerably. The brush is adjustable to the ring rail so that it will always be the proper distance from the traveler. It is passed along the ring rail by a cleaner, and any accumulation of waste on travelers is removed. K.R.G.

China Declares "War" on Thomas Nelson

Editor Overseer's Corner:

In the May issue of TEXTILE WORLD, the topic of "A Peek at the Warp Piqué," by Mr. Thomas Nelson, I read over and feel that the Fig. 2 is a misleading one which would cause many difficulties in weaving, for two picks are very heavy while the other two are light during the shedding. Here is a design which may produce a sample just the

Thomas Nelson's original Fig. 2 in Piqué article



Y. L. Chang's improvement on the Nelson weave

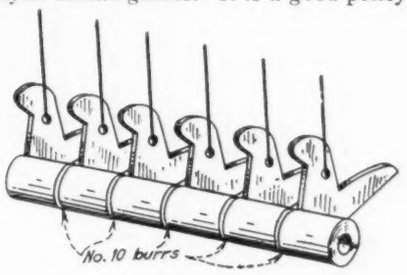
same as shown in Fig. 1, page 72. Both six- or fourteen-harness shafts may be used. I think it is better than Fig. 2. Am I right? Hope you write me a few lines. Many thanks.

Yours truly

Y. L. CHANG
YU FOONG (HOKEE) COTTON MILL, LTD.
CHENGCHOW, HONAN, CHINA

Single Ends and Drop Eyes

Single ends that are caused by the drop eyes on the stop motion touching each other can be prevented by inserting No. 10 burrs or small washers between the stop-motion castings, as shown in the sketch. This condition is found mostly on the older-type doubler machines where the small thread guides have been replaced with the larger rayon thread guides. It is a good policy



Burrs or washers between stop-motion castings

as well to install these burrs or small washers on the doublers that have small guides, since it keeps the stop-motion castings from rubbing each other and makes the motion work easier. W. C. P.

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Split Basket Weave

Readers offer suggestions on the prevention of rolling ends

"WHAT can be done to prevent overlapping of the warp ends in a split basket weave?" was a question published in the January, 1937, TEXTILE WORLD. We recommended that the inquirer use a fine reed. Since that date we have received several interesting and helpful communications suggesting various other methods of overcoming the difficulty. We publish them, gratefully, below.

Double-Reed Arrangement

Technical Editor:

In "The Overseer's Corner" of the January issue of TEXTILE WORLD, mention is made of trouble in a split basket weave due to rolling ends.

The suggestion made for correcting this situation was to use a finer reed. However, the disadvantage in this was pointed out to be bad work and consequent loss of production. This is quite understandable.

The inquirer speaks of using a double reed. There are, however, various types of double reeds, and we offer herewith a double-reed arrangement with which we successfully solved an identical problem.

Fig. 1 shows the split basket weave in question, using a straight draw in eight harnesses. Immediately below the harness draft is indicated the reeding plan, using two separate and distinct reeds. Beginning at the left, it will be seen that ends 1 and 2 are passed through the first dent of reed *A*, and that these same ends are passed through the first and second dents of reed *B*. This plan tends to keep the ends separated as does a false reed.

Fig. 2 shows the manner in which the second reed, *A*, is attached. It will be seen that reed *B* is set in the loom in the usual manner but that a separate provision must be made for reed *A*. Another reed must be made of oak or other suitable hard wood and fastened to the first rest by means of bolts or lag screws, as shown in the sketch. It will also be necessary to make four or five small clamps and to fasten them to the reed cap, with wood screws.

With the above arrangement, no great amount of extra work is required while hanging a new set of

harnesses. The front reed *B* is set in the usual manner, allowing reed *A* to hang on the warp threads; or, if this is considered too dangerous, it may be tied up temporarily. After the front reed has been fastened and lined up, it is necessary only to set reed *A* into its rest and fasten it securely by means of the clamps. The only precaution necessary is to make sure both reeds are properly in line so that the ends are not bent in a sharp angle while passing from one reed to another.

There are two further suggestions which may be of assistance in solving the problem.

Carry as much weight as possible, consistent with good work, on the warps. The purpose is, of course, to keep the warps as taut as possible, thus reducing the tendency to roll.

Close the shed as late as possible on the pick; that is, do not allow the shed to close until after the crankshaft has passed front center. Many weavers do not consider it good practice to run an early shed for the reason that with an early shed the warp has crossed over the pick and the reed is forcing the pick into place against pressure from the warp. This tends to set up disturbances which may contribute toward

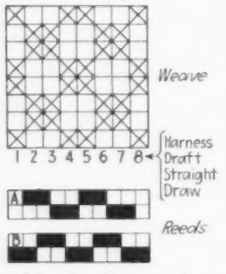

Fig. 1—Layout for double reed

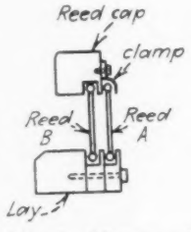

Fig. 2—Manner of attaching second reed

rolled ends. It can be readily seen that this condition does not exist when the timing is late. The pick is moved easily into place and the possibility of disturbing the warp does not exist.

PHILIP A. MONTAGUE
Connecticut

A Substitute Weave

Technical Editor:

I read with interest the item in regard to split basket weave which appeared in the January issue, on page 114.

While I am in agreement with your opinion that there is only one way to make a "genuine" split basket, I am nevertheless taking this opportunity of inclosing a layout which may prove of value to mills in the predicament in which your inquirer evidently finds himself.

The weave construction inclosed [Fig. 3] is one of a few successful weaves which I have used at various times; and to all intents and purposes it will give the same effect in the design of the fabric that a true basket will give. I have shaded the weave to illustrate the particular pattern given in your column. The decoration can be put in where the designer chooses.

It is essential that the various move-

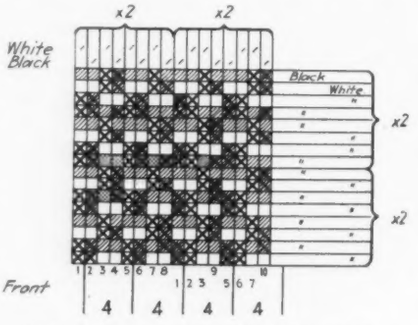

Fig. 3—Layout for substitute weave

ments of the risers (*x*) be used as shown; otherwise the shading would not be so perfect as appears in the true basket weave. It is also important to begin the warp and filling as illustrated and to repeat the draw and the bars of the harness chain and box chain, as any variation will spoil the perfect step effect now in evidence where the 1x1 filling crosses the 1x1 warp. This also holds true of the effect on the 2x2.

The use of the inclosed design will enable your inquirer to use a 15 reed, 4 per dent, and do away with the use of the double reed, which has so many objectionable features. In reeding, it will be necessary to instruct the drawer-in to reed the first end (of the first pattern) in with the left-hand selvage and from then on to reed 4 per dent across the warp and take the first end of the right-hand selvage into the dent with the remaining three warp ends.

As your inquirer stated, many mills make split baskets successfully; and this is one of the few methods that are used.

ALFRED R. HALLER
New Hampshire

By Breaking the Shed

Technical Editor:

With reference to the split-basket-weave problem discussed in the Questions and Answers section of the January Overseers' Corner, let us consider just why this trouble exists at all. It is because the threads 2 and 3, 4 and 5, 6 and 7, and 8 and 1 are always up together and down together. Consequently, if the yarn is at all hairy, one thread will rob from another and the two will become matted together.

When the particular draft shown in the January issue is used, the only two threads that do not mat together are 1 and 8; and yet, these two threads go together just as much as any other two. Why do they remain separate? The reason is that the shed is broken on these two threads, the stirrups being down on 1 and up much higher on 8.

You can break the shed on the others just as well. The loomfixers, by force of habit, always start the harness No. 1 on the bottom notch of the jacks; and, as the harnesses go back, they raise the stirrups one notch every two harnesses. This method is satisfactory on 90% of all weaves, but there are many times when a deviation from this rule is necessary.

In this particular draft I would advise that stirrups 1 and 2 be placed in the bottom notch, 3 in notch 6, 4 in notch 2, 5 in notch 7, 6 in notch 3, 7 in notch 7, and 8 in notch 8. If this does not do away with all defects, you can break the shed even more than I have suggested. However, you must separate 2 and 3, 4 and 5, and 6 and 7, or they will roll together.

BENJAMIN F. HAYES
Massachusetts

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Knitting Calculations

Offering improvement on methods outlined by Paul Smith in July TEXTILE WORLD

By J. Frederick Cahill

IN THE article "A Knitter's Calculations," by Paul Smith, appearing on pages 80 and 81 of the July TEXTILE WORLD, there is much of interest to the practical knitter and much that can be used with profit by men responsible for the quality and quantity of production. A proper application of the principles set forth in the article will result in a great saving of lost hour-pounds of production.

In my opinion, however, Mr. Smith's

calculations are a bit more complicated than is necessary for the attainment of the desired result. In the calculation for a speed constant his formula calls for circumference of cylinder in inches reduced to feet, this to be multiplied by revolutions per minute to obtain linear velocity of feet per minute. The result so obtained is multiplied by 60 to obtain a result in feet per hour which is what we are, or should be, really interested in.

As the speed constant is derived from cylinder diameter × revolutions per minute and the feet per minute is derived from cylinder circumference in feet × revolutions per minute, I would point out that just as 3.14 × diameter in inches = circumference in inches, so does 0.2618 × diameter in inches = circumference in feet. This multiplied by revolutions per minute, gives feet per minute.[1]

Taking the instance, cited by Mr. Smith, of a 20-in. cylinder operating at 60 r.p.m., then 0.2618 × 20 in. × 60 r.p.m. = 314 f.p.m. Also, 20 in. × 60 r.p.m. = 1,200 diametral revolutions, the speed constant.

In proof of the correctness of the foregoing formula, assume that a cylinder of 18-in. diameter operating at 75 r.p.m. shows the most desirable results. Then 0.2618 × 18 × 75 r.p.m. = 353.43 f.p.m. This, multiplied by 12 and divided by 3.14 gives 1,350 as a speed constant. The same constant, 1,350, is obtained by multiplying 18 by 75.

Production Constant

The calculation for a pound-hour-per-feed constant may be as simply made, because in this calculation we are dealing altogether with feet per hour, yards of yarn per foot of cylinder travel, yards of yarn per hour, and yards of yarn per pound. This is easily translatable into pounds per hour per feed. Inches per yard, grains per yard, and grains per pound have no part in the calculation.

In the instance cited of a battery of cylinders operating at a uniform linear velocity of 314 f.p.m. on 30s cotton yarn, a 1-in. cylinder operating at 1,200 r.p.m. would consume as much yarn per feed as would a 20-in. cylinder operating at 60 r.p.m.

A carefully measured yard of 30s cotton yarn occupies 14 in. on the needle line, and each inch of the 14 in. is occupied by 1/14 of a yard. Therefore, 1 ft. of needles is occupied by 12/14 or 0.857 yd. of yarn. Since 314 f.p.m. of cylinder travel × 60 = 18,840 f.p.h. (feet per hour), 18,840 f.p.h. × 0.857 yd. per ft. = 16,145.88 yd. of 30s yarn per feed per hour. Since 1s cotton yarn contains 840 yd. in one pound, 840 yd. × 30 = 25,200 yd. per pound of 30s yarn and 16,145.88 yd. per hour ÷ 25,200 yd. per pound = a constant of 0.6407 lb. of 30s yarn per hour per feed. The number of feeds on any cylinder × 0.6407 = the hour-pounds production at 100% efficiency.

In the instance cited of a 24-in. cylinder equipped with 9 feeds, compare the amounts of calculation necessary to obtain the per-pound production. Note the simplicity of 0.6407 × 9 = 5.7663 lb. per cylinder-hour at 100% efficiency.

As my result shows .23 lb. more than that of Mr. Smith, I invite correction, if due.[2]

Footnotes:

[1] So far as developing the speed constant is concerned, it seems unnecessary to us that feet per minute, as Mr. Smith suggests, or feet per hour, as Mr. Cahill suggests, be involved. The calculation can be carried out entirely in inches, as follows:

Diam. in inches × 3.14 × R.p.m. = 3,768 in. per min.

$$\text{R.p.m.} = \frac{3{,}768}{\text{Diam.} \times 3.14} = \frac{1{,}200}{\text{Diam.}}$$

However, as Mr. Cahill helpfully points out later in his text, the constant—in this case, 1,200—can be obtained merely by multiplying the diameter in inches by the revolutions per minute. The formula which represents this calculation can be derived by solving the above equation for 1,200, the constant, thus: 1,200 or Constant = Diameter × R.p.m.—*Editor.*

[2] The difference lies in the inaccuracy involved in developing and using so small a constant as Mr. Smith's .002 lb. Therefore, although Mr. Cahill claims only greater simplicity for this method, it appears that he might also claim greater accuracy.—*Editor.*

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Gaston Spinners

Discuss power economies and general mill problems

POWER economies and general spinning problems were discussed at the fall meeting of the Gaston County, N. C., Division of the Southern Textile Association, held Sept. 24 at the Community House of A. M. Smyre Mfg. Co., Gastonia, N. C. Marshall Dilling, chairman of the division, presided.

C. K. Bryant, of Bryant Electric Repair Co., Charlotte, N. C., was guest speaker. Speaking on "Power Economies," Mr. Bryant brought out the following points:

The use of good oil of the proper consistency is one of the most important ways of saving power. Probably 90% of the burn-outs in motors are due to bearings which have become worn because lint and dirt have interfered with their oiling and operation. Worn bearings pull the rotor off center and require additional power for operation. Motors should be checked for alignment at least every 90 days. Single phasing may be caused by bad fuse connections or other factors. It is particularly likely to occur in old motors. Single-phasing will double the cost on a full load and burn up motors.

A motor is no better than its controls. Jogging motors causes increased power consumption, sometimes two to seven times normal amount necessary. Contacts will last much longer if the motor is started and stopped properly. If a new fuse blows, find cause and do not put makeshift contact in the box. It is a bad practice to utilize same transformer for power source and for lighting or humidifiers, as the system is likely to become unbalanced, he said.

New or green cotton under normal conditions, where there is no dyeing problem, should be mixed with the old crop in the opening room, according to S. H. Sherman, because the new crop has a tendency to dry out and the work gets light.

The best speed for a vertical opener was agreed to be somewhat lower than usually recommended. There were reports of 500 r.p.m. on $1\frac{3}{16}$-in. cotton, 400 r.p.m. on $1\frac{1}{4}$-in. cotton, and 300 to 350 r.p.m. on similar cottons.

Traverse grinders should be operated at 600 r.p.m., with 1 1/3 traverses across per min., reported W. N. Williams. G. R. Russell thinks 600 r.p.m. about the right speed, but finds his traverse requires only 23 sec. across the cylinder. He grinds about 9 sq.in. per min. Mr. Dilling added that he operates at 698 r.p.m. and that his traverse (one way) is only 15 sec.

Roll stands on spinning frames are inclined from 15° to 35° according to the class of work being run, declared D. H. Whitener. For warp and hard-twisted yarns, a 25° pitch is recommended. For filling and soft-twisted yarn, a 35° stand is often used. The 30° stand, however, is usually used where both warp and filling are to be spun on ring frames. One machinery manufacturer recommends a 30° stand for long-draft spinning and regular three-roll draft on yarns of 20s or over and a 28° stand for regular three-roll draft on yarns under 20s.

With reference to roll coverings, George R. Grice suggested that 100% wool backing beneath leather helps prevent packing of the leather after long service.

A prepared report on the "spinning

tape factor in power saving" was presented by G. A. Lay.

"The saving to be realized by the adoption of a lighter spinning tape," Mr. Lay explained, "will range between 10 and 20% of the annual spinning power costs on tape-driven spindles. In a 100,000-spindle mill this would mean from $8,000 to $16,000 a year. The type of tape in common use today is too heavy, too thick, and too stiff to give maximum efficiency, and it is affected by moisture and oil. Mill men who care to estimate the savings possible in their own mills may do so very easily by subtracting from the thickness of the tape in use (in thousandths of an inch) the thickness of the lighter tape and multiplying the result by 0.80. The final figure will represent the approximate percentage it is possible to save.

Personal News

W. A. Preston has resigned as chemist for the American Yarn & Processing Co., Mount Holly, N. C., and has entered the Medical College of Virginia, at Richmond, to take a four-year course in medicine. **Horace Doans,** Mr. Preston's assistant has been appointed to succeed him.

H. H. Taylor, formerly of Greer, S. C., has become a member of the main office force of the Randolph Mills, Inc., Franklinville, N. C.

Richard C. Nyman of New Haven, Conn., has been made personnel manager of the Kendall Co., with headquarters at the Thrift unit, Paw Creek, N. C.

W. E. Baker has resigned as overseer, weaving and cloth departments of the Woodside Cotton Mills, Fountain Inn, S. C., and overseer of the weaving department of that company's Simpsonville, S. C., unit and is now overseer of slashing at the Woodside Cotton Mills, Greenville, S. C.

G. Rhymer has resigned as overseer of the spinning department of the Riverdale Mills, Enoree, S. C., and is now a traveling representative for the Dary Ring Traveler Co., Taunton, Mass., with headquarters at Greenville, S. C.

W. J. Phillips, formerly of Gastonia, N. C., has become overseer of night spinning at the Riverdale Mills, Enoree, S. C.

Joseph Hammel, oldest operative of the Belmont (N. C.) Mill, has just celebrated his 60th anniversary with this mill. He is now 74 years of age.

Limerick Honors Brooke

THE EMPLOYEES of Limerick, Maine, Yarn Mills drawing room recently presented Harold Brooke with gifts of traveling case containing useful articles and a purse of money before his departure for Philadelphia where he is taking up new duties in the textile business. The overseers, mill hands and office help sponsored a clam bake at the club rooms as a sendoff, presenting him with another purse of money. Singing and dancing followed.

C. R. Moore has become overseer of the spinning department of the Cedartown (Ga.) Yarn Mills. He formerly held a similar position with the Chicopee Mfg. Co., Gainesville, Ga.

W. W. Splawn has resigned as overseer of spinning at the Watts Mills, Laurens, S. C., and has accepted a similar position with the Upper Mill of the Pelzer (S. C.) Mfg. Co.

John Strater, formerly of Raleigh, N. C., has become general overseer of the spinning and winding departments of the Smithfield (N. C.) Mfg. Co. He formerly held a similar position with the Pilot Mills, Raleigh.

Marion Kirby, formerly overseer of the winding department of the Watts Mills, Laurens, S. C., has been appointed overseer of the day spinning department.

L. M. Thompson, formerly with the Bibb City unit of the Porterdale, Ga., plant of the Bibb Mfg. Co., has been made shift foreman at the Osprey plant's spinning department, succeeding **P. S. Leach,** resigned.

H. B. Clyburn, Jr., Concord, N. C., who has been second hand in the spinning room of unit No. 4 of the Cannon Mills Co., Kannapolis, N. C., is now overseer of the spinning department at unit No. 5 of the same company at Concord. He succeeds **J. L. Bullabaugh,** resigned.

J. C. Holt is now overseer of the carding department of the Atlantic Cotton Mills, Macon, Ga. He was formerly with the Eagle & Phenix Mills, Columbus, Ga., in a similar capacity.

Robert B. Riddle, formerly of Birmingham, Ala., is now overseer of carding at the J. W. Sanders Cotton Mill, No. 3, Meridian, Miss.

J. W. Pardue, superintendent of designing and assistant plant superintendent, Cutter Mfg. Co., Rock Hill, S. C., has resigned.

R. W. Knox, superintendent of the knitting division of Clyde Fabrics, Inc., Newton, N. C., has resigned. He is succeeded by **A. L. Saunders,** formerly assistant superintendent.

S. C. Divisions of S. T. A. Reorganize; Meetings Announced

THE SOUTH CAROLINA spinning and weaving divisions of the Southern Textile Association have been reorganized into a new group known as the Western South Carolina Division. The first meeting of the division is scheduled to be held Oct. 23 at Greenville, S. C., and there will be another meeting next spring. Joseph C. Cobb, of Chiquola Mfg. Co., Honea Path, S. C., is general chairman of the division. Robert Stutts, superintendent of the Fountain Inn and Simpsonville plants of Woodside Cotton Mills Co., Greenville, is chairman of the spinners' group. Smith Crow, general superintendent of Drayton Mills, Spartanburg, S. C., is chairman of the weavers' section of the division.

The Eastern Carolina Division of the S. T. A. met Oct. 9 at West Durham, N. C., and a detailed report of the proceedings will be published in an early issue. J. V. McCombs, superintendent of Pilot Mills Co., Raleigh, N. C., is chairman.

J. N. Jones has resigned as overseer of carding and spinning at the Phenix Mills, Inc., unit No. 1, Kings Mountain, N. C., and has become general overseer of carding at the Riverdale Mills, Enoree, S. C.

F. N. Moore of Cramerton, N. C., has become overseer of weaving at J. W. Sanders Cotton Mills, Inc., Starkville, Miss., unit No. 1.

E. F. Stevens, formerly of Langley, S. C., is now overseer of the cloth room of Mathews Cotton Mill, Greenwood, S. C.

H. C. Skelton, formerly cost accountant for the Springs Cotton Mills at Chester, S. C., has been appointed overseer of the carding and spinning departments of the Gayle plant, No. 2 mill. He succeeds **L. W. Green,** who recently resigned.

J. W. Trigg, formerly of Selma, Ala., has become overseer of weaving at the Gayle plant of Springs Cotton Mills, Chester, S. C.

E. C. Lee, formerly with the Flint River Cotton Mill and the Hawkinsville Cotton Mills, Albany, Ga., is now overseer of spinning, spooling, winding and twisting at the Washington Mfg. Co., Tennille, Ga.

W. H. White has resigned as assistant superintendent of the Blue Ridge Rayon Mills, Alta Vista, Va., to accept the position of superintendent of the Ladlassie plant of the Gossett Mills, Anderson, S. C.

E. H. Dreher, formerly of Winnsboro, S. C., is now overseer of carding at the Sanford (N. C.) Cotton Mills.

C. S. Billings, formerly of Claremont, N. H., has been put in charge of finishing at the Black Bear Woolen Mills, Proctorsville Vt.

James F. Doran has resigned as overseer of finishing at the Wyandotte Worsted Co., Rochester, N. H.

E. R. Eaton, formerly of Suncook, N. H., is now in charge of spinning at the Pepperell Mfg. Co., Fall River, Mass.

Edward Kuehnel has been placed in charge of carding and spinning at the Pittsfield (N. H.) Mills.

Roland Gantt, formerly with Dover Mill Co., Shelby, N. C., is now cloth-room overseer of the Springs Cotton Mills, Kershaw, S. C.

A. L. Saunders is now superintendent of knitting at Clyde Fabrics, Inc., Newton, N. C., succeeding R. W. Knox, resigned.

R. W. Gibson, formerly with Phenix Mills, Inc., Kings Mountain, N. C., is now overseer of spinning at Sanford (N. C.) Cotton Mills.

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Silver Anniversary

A MILE-LONG parade was among the events on the program of Harriman (Tenn.) Hosiery Mills' Silver Anniversary Celebration, mentioned briefly in these columns last month. Leaders of the parade were Tom Tarwater (with straw hat), president of the mill; W. W. Gfroerer, (at right of Mr. Tarwater) representing J. P. Voorhees & Son, Inc., selling agents, New York; R. C. Williams, superintendent knitting department, and Charles Hill, stockholder, (directly behind)—followed by Asbury Wright, vice-president, and M. W. Walker, secretary and treasurer. Other officials, stockholders, and employees comprise the remainder of the line. Additional features of the anniversary program were softball games, free movies, musical entertainment, fireworks, and addresses by mill and city officials. Mr. Tarwater was presented with a watch by the 1,000 employees of the mill and a silver loving cup by J. P. Voorhees & Son, Inc., also celebrating its silver anniversary.

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Questions & Answers

Finishing Rayon-Woolen Blends

Technical Editor:

We were greatly interested in the article on fulling and napping rayon blends which appeared in your July issue.

May we impose on you further, and ask that you post us on the following details? We were wondering what the object is of rolling up the fabric before wet napping. We had tried both methods, but did not seem to note any appreciable difference. Do you think there is a chance that we missed out on part of the routine to demonstrate the favorable possibilities of this pre-rolling before napping? (8485)

We referred this inquiry to David Welsh, author of the above-mentioned article, who replies as follows:

"The trend of finishing today is toward speed—off the loom today and off to New York tomorrow. We wonder why foreign goods are so popular with good dressers. The answer might well be, a superior and more permanent finish. The emphasis in Europe is on the finish, time is not so important, wet rolling is almost a sacred ceremony, and on some cloths, oft repeated.

"Sponging, especially so-called steam sponging, is the acid test on finish and will show whether or not the fabric is fit for rag or raiment. The results of pre-rolling are particularly apparent after the goods have been sponged.

"Wet rolling has many worth-while advantages on any fabric, and especially on wool and rayon blends. It gives the cloth the opportunity of ageing, imparting a mellowness not otherwise obtainable—mellow, yet firm, without being boardy. It adds to the strength, producing a more permanent 'after-finish.' The after-finish affects the marketability, resulting in repeats or cancellations.

"Wet rolling 'does things' to many fabrics that nothing else can accomplish. On piece dyes it is invaluable, putting the goods in a uniform condition from end to end and list to list; one seldom sees side-to-center shading on pre-rolled piece dyes; better penetration is assured; and the boiling never rags the fabric, as occurs when the goods are dyed raw from the washer."

Static in Knit Tubing

Technical Editor:

I am mailing you a sample of yarn and tubing made from it on Scott & Williams tubers. On leaving the take-up rolls, the tubing has the appearance of being stiff and harsh, but does not have this feel. It also seems to contain static electricity, as it goes to and clings to the sides of the cans, which are stationary cans placed on the floor under the machines to hold the tubing until it is rolled on spools. We have tried grounding the cans and machines to a water pipe, but this has done no good. Will you please advise what is causing this condition? (8467)

It seems likely that the trouble is due to static electricity as you suggest. This yarn has been bleached, and bleached cotton is likely to give more trouble in processing than unbleached. These small tubing machines run at high speed, and the yarn drawing through or over the parts may be developing a static charge due to the friction against those parts.

As this tubing is to be wound on spools, it might be found practical to arrange a horizontal spindle on which the spool could be mounted below the cylinder and take-up and slowly driven to wind the tubing directly on the spools. This would prevent the tubing from getting out of control. Circular necktie machines make use of this idea. The spool may be driven by a band from the take-up-roll drive.

Humidifying your knitting room would be an excellent solution to your problem, although expensive. It is possible that conditioning the yarn would help. If this yarn is very dry, static trouble is likely to develop more quickly. Storing the yarn in a damp or humidified room some hours before knitting might reduce, if not wholly eliminate, the static.

Streaks in Rayon-Acetate Fabric

Technical Editor:

Inclosed are two samples—one of the raw goods, and one of the finished goods—of an acetate and rayon fabric. You will note that on the finished sample the acetate should be a clean

white. Some of the stripes come out a clean white and on the other stripes there are black streaks running regularly through the stripe. We shall appreciate your opinion as to the cause of these streaks. We have dyed these goods with as many as fifteen pieces in one box, and, for example, twelve of the pieces come out with the acetate a clean white and the balance of three pieces will come out dirty. (8469)

The black streaks in the white stripe are saponified threads of acetate. The sample strips down with alkaline hydrosulphite to a fair white. On redyeing with a black which does not dye acetate, the streaks show up once more. Examination of the raw goods shows that the cloth is woven of rayon, acetate, and an acetate warp that is made up of vigoureux-printed acetate yarn. The yarn is probably printed with an alkaline paste in two different strengths before it is beamed. After weaving and dyeing, the printed portions dye with rayon colors, the depth of the dyeing depending on the strength of the alkaline paste; i.e., the amount of saponification. The so-called all-white stripe shows evidence of an occasional light pink tint very similar to that of the printed or otherwise pretreated stripe. This light pink dyes like the streaks in question after scouring.

The spoiled goods may be reclaimed by a rapid treatment in the full width, on a continuous machine, with cold alkaline hydrosulphite. This will cause the black to turn slightly more purple, but the light objectionable streaks will fade to the point where they are not noticeable.

Setting Card Flats

Technical Editor:

In order to settle an argument, we are coming to you for advice on which way to insert the flat gage for the setting of the flats to the cylinder of card. Should the gage be inserted on the heel or toe side of the flat? We should like to know advantages and disadvantages of both methods. (8459)

Both methods are used. The first is the more common and the easier to manage, but it is not necessarily the more correct. The argument in favor of the second method is that it tends to force loose flat wire to a more upright position or to the position that the wire takes when the machine is running. All other things being equal, however, both methods will give the same quality of work, the same operating conditions, and the same machine conditions.

In 1928 one Canadian mill went so far as to set 100 cards by the first method and 100 cards by the second, running them this way for over a year. The results did not favor either method over the other, even with respect to faced-wire or loose-wire conditions, or to general appearance of strips, sliver, and yarn. The same mill ran flat-setting tests over a long period and could not find that flat settings of 10/1000 were any better than those of 15/1000. On the contrary, it did note that flat conditions were better where 15/1000 settings were used.

Over most of the setting area, the gage is slid and not moved in and out with and against the wire points. There is a tendency to change the angle of the gage and sometimes allow the flat gage to contact the wire on the next flat. Also, the flat is sometimes not held down sufficiently while the gage is tried. It therefore appears that the individual himself is more important than the method followed.

In other words, common sense enters into card setting more than any definite rule, even where a mill has a fixed standard of, let's say, 10/1000 for the flat form cylinder. A good grinder would not use this gage in setting his flats if the clothing did not warrant such a setting. It is like arguing as to what lickerin speed is the best without taking into consideration all those items that effect production, quality, and machine conditions.

To conclude: The theory of setting would favor the method of inserting the gage from the toe side; but, if each man in this argument uses common sense when making his setting, there does not appear to be any reason why results from one method should not be the same as from the other.

Shuttles Slide from Box

Technical Editor:

As a loomfixer, I have asked many old fixers what is the best way to stop the shuttles from sliding out of the boxes up to the shuttle guard, causing the loom to bang or make the shuttles fly over; but to date I have not had a satisfactory answer. Will you kindly inform me as to what is the best method to stop this? Also what causes the twisting of yarn (on lenos) between the jazz bar and the last harness of the warp? In some warps, as you know, this happens; and, as might be expected, it causes a lot of breakage of the yarn. Sometimes I make a lease with two flat rods; and the results are perfect—but there must be a reason why this happens in only very few warps. (8483)

The sliding out of shuttles from the boxes on drop-box looms is a common trouble if some of the shuttles are inactive for long periods. There are three main causes for it: (1) improper contact of binders, (2) shuttle worn to an elliptical shape, and (3) picks from opposite side too harsh.

The binders may be so bent that the contact will lie beyond the straight portion of the shuttle front wall, with the result that they will have a pressure angle of less than 90° in relation to the shuttle. This will, of course, have a tendency to force the shuttle gradually away from the binder pressure, a movement which will be assisted by the jarring of the loom. The binders should therefore be of such a shape that the pressure point will lie on the straight portion of the shuttle, in which case the pressure angle will be 90° to the shuttle. The contact area of the binders against the shuttle should be as large as it is practical to maintain.

There is another thing that we have to guard against, if we want the inactive shuttles to stay in the box; and this is too much play between the tip of the binder and the binder stop. The play here should be so small that daylight can barely be seen between the tip of the binder and the binder stop when the shuttle is fully boxed. If it is more than this and the binder spring does not press excessively against the binder, the latter has a tendency to move against the stop at the beat-up. This, of course, relieves the shuttle of any pressure from the binder, and it is free to slide out of the box a little at a time. The shuttle must be under pressure from the binder at all times if it is to be prevented from gradually sliding out of the box.

Shuttles running in poorly lined-up looms will wear down more at both ends than in the middle. In this case the walls of the shuttle are elliptically shaped and its sides are not parallel as in a new shuttle. It is obvious that in this case the pressure of the binders will have a tendency to force the shuttle out of the box by exerting pressure at an angle which is less than 90° to the shuttle. In order that this might be avoided the point of contact between the binder and the shuttle would have to lie so far forward that it would be in at least the middle of the shuttle. If the shuttles are not too much worn, they can be trued by planing off the central portion, but care should be taken to plane off all the shuttles so they will be uniform in size.

If the pick from the side opposite to the drop box is too harsh, or the shuttle box is too tight, there will be a pronounced jar of the loom every time it picks from this side. It will act about the same way as the head of a hammer when it is driven up on the handle by tapping the end of the latter. To remedy this condition, reduce the force of the pick if possible and loosen up on the binder pressure on the shuttle, placing more of the retardation on the picker-stick check.

As to what causes the yarn to become twisted on the jazz bar in leno weaving, it is difficult to say with any great degree of accuracy. However, this trouble is very common in the weaving of lenos of fine cotton yarn, rayon, or silk. The customary way to prevent it is to use a "dead" harness instead of a jazz bar. If the doup ends are drawn in the harness eyes, instead of being placed under the jazz bar, they are prevented from twisting around each other. This "dead" harness is supported from a stationary jack in the dobby, or from the arch of the loom, in such a position that the eyes will be about 2 in. below the eyes of the standard harnesses and in back of those harnesses. It is held down by springs which yield slightly on the cross shed to compensate for the increased tension of the warp ends on this shed. Weavers on fine lenos state that this method is better than the use of a jazz bar and lease rods. In some cases "dead" jacquard harnesses with lingoes of suitable weight are used, instead of a jazz bar, to prevent the warp ends from twisting.

Tricot Knitting Production

Technical Editor:

In your August issue, on page 106, you answer an inquiry in regard to the tricot knitting production of this country. I realize that the information may have been hard to get, but regret to note that the figures you give concerning production are incorrect.

There are over 800 tricot machines in the country and the number that has been operating at capacity for several years past is nearer 700 than the 350 which you estimate.

The Department of Commerce figures referred to by the person who inquired for information are based on 100 rack pieces of tricot and 70 rack pieces of milanese. This standard was set up by the committee on which the writer served, which arranged the forms on which reports are furnished to the Census Bureau.

If you care to have the person who inquired for the information communicate directly with me, I shall be glad to give him any further details which are available.

James Rogers,
President, Fulton County Silk Mills.

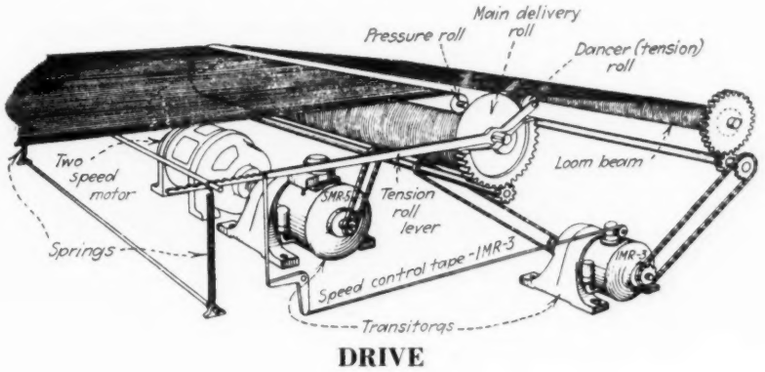
New Machinery and Processes

Variable-Speed Drive for Slasher

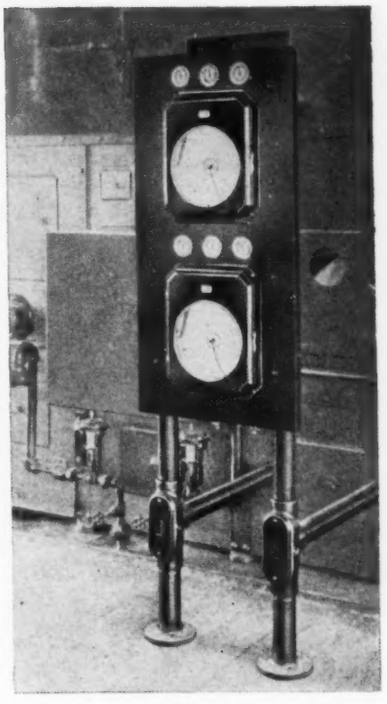
• The variable-speed drive on the head end of the new Saco-Lowell slasher described by U. E. Dubois at the fall meeting of the Textile Operating Executives of Georgia, reported on pages 80 and 81 of this issue, requires a more detailed explanation. This ingenious drive was designed primarily by F. D. Snyder, of Westinghouse Electric & Mfg. Co., working in collaboration with Saco-Lowell engineers at Biddeford, Me. It employs as its means of variable-speed transmission the Transitorq developed by New Departure, Bristol, Conn., and first described in the May, 1935, issue of TEXTILE WORLD, page 115. The purpose of the drive is to provide constant yarn tension, freedom from undue yarn stretch and breakage, and concentric beams.

The accompanying sketch illustrates the principle of the drive. The Westinghouse two-speed motor is direct-connected to the input shaft of the first Transitorq, Model SMR-5. From the output shaft of this Transitorq is driven (through belt, shaft, and gears) the main delivery roll, which governs the speed of the yarn through the slasher. Also driven indirectly from the first Transitorq is the input shaft of the second Transitorq, Model IMR-3, which in turn drives the loom beam at a constantly varying speed as the beam builds up, thereby maintaining a constant yarn speed. The speed ratio of the second Transitorq is governed by the action of the dancer or tension roll over which the yarn passes when it leaves the main delivery roll. When the increasing diameter of the beam tends to increase the speed of the yarn, a tension is created in the yarn which pulls the tension roll down and so raises the tension-roll lever against the action of the springs. The lever, in rising, pulls the speed-control tape attached to the Transitorq and thus reduces the speed ratio and slows down the beam.

The operation of the drive is normally about as follows: In starting, the operator presses a "Slow-Speed" push button which cuts in the main driving motor at 600 r.p.m. and moves the yarn at a rate of 10 yd. per minute. At the proper time he pushes the "Full-Speed" button, with the result that the motor is switched to 1,200 r.p.m., the yarn-cooling fan motor (not shown) is started, and the Transitorq valve solenoid is energized to bring the SMR-5 up to whatever speed has been preselected. For slowing down, the operator again presses the "Slow Speed" button, which puts into operation a series of automatic steps that reduce the speed gradually and hence prevent over-running of back beams and snarling of yarn. When the beam-head clutch (not shown) is disconnected from positive engagement for the removal of a full beam, the springs return the dancer or tension roll to high-speed position in preparation for beginning work on the small diameter of the new beam.



DRIVE



CONTROL

Slasher Control System

• One of the features of the Saco-Lowell high-speed slasher described elsewhere in this issue is the control system developed by Taylor Instrument Cos., Rochester, N. Y., and built in as an integral part of the machine. This system, which is an adaptation of the well-known Taylor system of slasher control is designed to coordinate the control of temperatures and pressures throughout the slashing operation and to insure a constant liquid level in the size box. In recent years it has been recognized that even for the older slow-speed machines a control system is a desirable addition to a slasher. On high-speed machines slasher control is said to be a necessity, and accordingly all new Saco-Lowell high-speed slashers are equipped with the Taylor unified system of slasher controls.

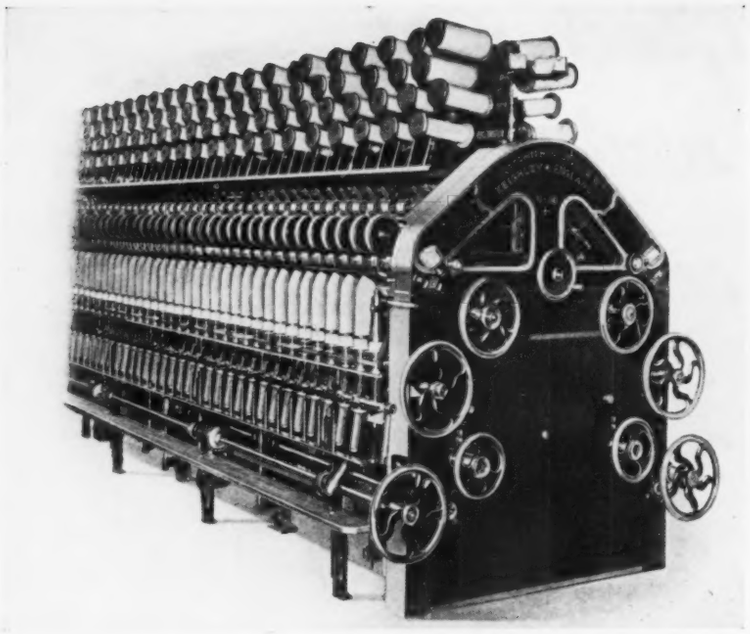
The system starts at the size cooking kettle, where a recording Fulscope time-schedule controller is used, which makes possible the exact duplication of the cooking time and temperature cycle once it has been established. The storage or blending kettle is also under automatic temperature control, so that the cooked size is kept in good condition for delivery to the slasher itself. A Type P temperature controller and Motosteel diaphragm valves are used on the storage kettle and also on the size box.

Two Dubl-Duty Fulscope controllers regulate the individual cylinder temperatures. Admission of steam to the cylinders, and consequently their respective temperatures, are controlled by the temperature of the condensate. This is accomplished by installing the bulbs which actuate the steam-condensate valve in the condensate line. No traps are used, which means exceptionally quick heating of the cylinders and high efficiency due to rapid and frequent discharge of condensation. An exclusive feature of this control as installed makes possible a temperature gradient as the yarn passes to the successive cylinders, which retains the required moisture in the yarn and keeps it elastic and pliable.

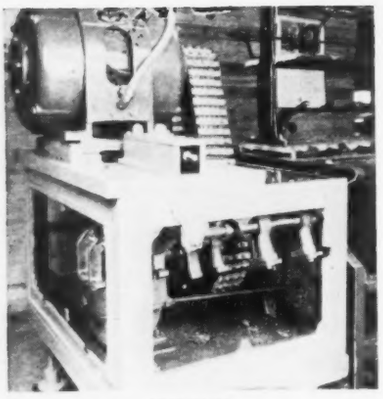
One of the chief advantages claimed for the system is that it gives precision control of the solid deposit on the yarn and proper retention of this sizing as the yarn passes through the loom and into the cloth room, thus making possible more uniform cloth weights. Another important advantage is increased weave-room efficiency.

Mechanical Doffer for Cap Spinning Frames

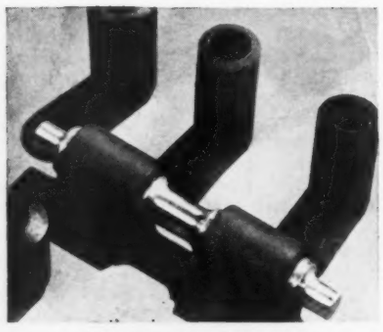
• A system of mechanical doffing has been developed by Prince-Smith & Stells, Ltd., Keighley, England, the American representatives for whom are Atkinson, Hase-



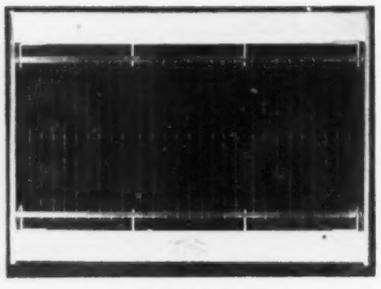
MECHANICAL DOFFER



DRIVE



ROLL COVERING



FRAME

rick & Co., 152 Congress St., Boston, Mass. The mechanical doffer cap-spinning frame has been offered to the worsted trade to increase the efficiency of the operators in the spinning room. At the same time it produces yarn equal in quality and quantity to that obtained from the non-doffing frame. The manufacturers state that yarn from the two types of frame may be mixed without any fear that there will be a noticeable difference.

The operation of the various movements necessary for the doffing takes place at the end of the frame by means of a number of hand wheels and levers. Unskilled operatives are able to manipulate this type of frame without any difficulty, and two of them can take the place of from eight to ten hand doffers. The time taken to doff a mechanically operated machine averages 1½ min. The saving in wages effects a saving in yarn production costs. With hand doffing the spindle tops and holes in the cap heads are subjected to undue wear because the caps and bobbins are rarely taken off or put on the spindle correctly. The mechanical system results in longer life for spindles, caps and bobbins, it is said. The manufacturer states it is possible to convert existing frames to the new system and no additional floor space is required.

Variable-Speed Drive

• A variable-speed device has been developed by J. A. Jepson, 341 Ponce de Leon Ave., Decatur, Ga., assisted by his father, Alfred Jepson. It furnishes a positive drive, not depending on spring action to develop traction between belt and disk. Positive shifting levers open and close the space between disks. The motor is mounted on a horizontal sliding base and its movement is actuated by a screw shaft connected with the builder motion on the spinning frame. Bevel gears connect this screw shaft with the shifting levers on disk control, varying the speed as required by the builder motion.

There is also a dual-speed device which makes it possible to set the controls so that the return cycle from high to low speeds is completed in 50% of the time required to build up from low to high.

Another feature is the provision for setting the device for any required speed without disturbing the time element of the speed pick-up and return settings on the dual control. This saves time where yarn numbers are changed.

Speed setting mechanism is easily accessible and speed changes can be instantly made for different number yarns. It is possible to interrupt a predetermined cycle and operate the frame at a lower, or higher, speed temporarily by manual control of the clutches provided for the purpose. On completion of the cycle the device will automatically resume normal operation.

A centralized lubricating system is incorporated. A film of oil is maintained on the inside face of the hub, eliminating gumming up and sticking of the disks to the shaft. Grease is used on all other bearings and both grease and oil fittings are conveniently located at top of housing.

The belt is made of special self-lubricating bronze-alloy links carrying laminated leather blocks. Links are connected by lapped and grooved drill-rod steel pins. Belt can be lengthened or shortened by adding or removing blocks, which are interchangeable.

This drive is applicable to any machine where automatically controlled variable speed is desired. It is applicable also where automatic control is not required, with disks mounted direct on driveshaft of machine driven from motor on horizontal sliding base. Variable speed is obtained by setting disks at any desired spacing, with unchanged center distance from driven shaft to center line of motor. The driven shaft is graduated to indicate proper setting of collars to give various speeds. A model installation has been made at Decatur, Ga.

Synthetic Roll Coverings

• Synthetic, rubber-like materials are now being offered by Armstrong Cork Products Co., Lancaster, Pa., for textile mill services. Roll coverings, temple rolls, and ribbon material for frictional purposes are all products now on a production basis, and others are being developed. The materials now offered are Armstrong's Accotex K-500, Accotex KC-550, Corprene DC-150, and Corprene DK-107.

Combination of cork with the synthetics brings out the better properties of both, it is said. For example, it is indicated that the right amount of cork eliminates eyebrowing, tends to minimize top roll laps, and improves the bond to the roll (Accotex KC-550 and Corprene DC-150). Greater resistance to oil and longer life are the chief advantages cited for these synthetic materials.

Heddle Frame

• In its tubular-aluminum-end heddle frame, Emmons Loom Harness Co., Lawrence, Mass., has made a heddle frame that will retain its rectangular shape, it is claimed, under severe operating conditions. The frame is constructed with ends of tubular aluminum, rigidly braced with flat end plates and secured with Hexcap or Philistic head bolts. All parts are rust-resisting and guarded against vibration. The frame may be equipped with the new one-piece locking system, as shown in the illustration, or standard as desired.

Dry Fulling Mill

• A continuous dry fulling mill has been put on the market by Riggs & Lombard, Inc., Lowell, Mass. It is the first machine of its type and has successfully passed a two-year mill test. It performs woolen-mill "dusting" or "crushing," formerly carried out on rebuilt fulling mills on the batch system. The continuous operation of the new machine facilitates production gains. The work is done by a multiplicity of squeeze rolls, with forward and backward motion.

The number of rolls is determined by the work to be handled and the ratio between the forward and backward movements is adjustable to give net delivery speeds of 6 to 30 yd. per min. The number of nips given the cloth is under easy control.

The new machine may be hooked up in tandem with the carbonizing range, making the processes of steeping, drying, baking and crushing, one continuous operation.

Solenoid-Type Electric Cloth Guider

• A new, solenoid-type electric guider said to operate efficiently on cloth running up to 300 yd. per min., has been announced by H. W. Butterworth & Sons Co., Philadelphia. The guider has few moving parts and all parts subject to wear have oilless bearings.

An entirely new type of electrical contact was designed to operate the guider. A movement of $\frac{1}{64}$ in. is required to make and break the electrical contact. Once adjusted, this contact never needs to be reset. It is completely sealed.

The electrical operating unit of this new guider can be supplied to take the place of the valve mechanism of the Foxwell air guiders which the company has made for more than 20 years.

At present electric guiders only for 110-volt, 50-60 cycle, a.-c. operation are supplied, but the company will soon market electric guiders for practically any voltage and cycle; also for direct current operation.

Stiffness Tester

• In order to get away from the human element, an accurate stiffness tester has been developed by Dr. Irving J. Saxl, Consulting Physicist, Industrial Trust Bldg., Providence, R. I. Instead of bending a piece of material in the hand to evaluate, by the sense of touch, the resistance against bending, the instrument introduces a precision bending equipment combined with a sensitive balance.

In operation, the piece of cloth to be investigated is inserted in the clamp on the left side of the machine. The other end of the material rests upon one side of the balance. If the knob that holds the cloth is turned, the right side of the strip of cloth will then press upon the pan of the balance.

Pressure on the pan will be the greater the stiffer and harder the cloth. For a given weight, say for instance 10 grams, it is necessary to turn the knob that holds the standard piece of cloth very little, only say 15° if the cloth is stiff, but it must be turned a great deal more, say to 60 or 70° if the cloth is soft. After the removal of a given deflection, different types of cloth may not return to zero position, but a certain deformation will remain within the test piece, and this permanent set can be measured on the protractor.

The device offers precision means for measuring stiffness, elastic hysteresis, elastic yield, and elastic recovery of sheet-like materials, such as rubber, cloth, felt, paper, thin metal sheets, and the like, independent from the human element; also the efficiency of softening agents, the effectiveness of stiffening agents, the effects of processes that should lend resiliency to the cloth.

Improved Hurricane Dryers

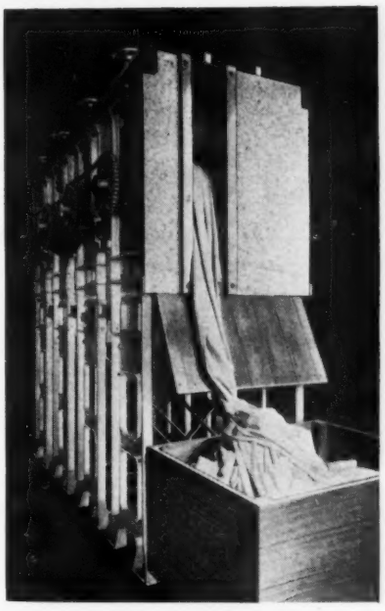
• Stream-lined interiors are now a feature of modern Hurricane dryers made by Philadelphia Drying Machinery Co., 3351 Stokley St., Philadelphia. They are said to result in greater volume of air movement, with less friction and power. Where the structural members and insulated panels come together, there is now a smooth and flush surface, free of pockets where lint and fly might collect. As the new machines are easy to keep clean, much time is saved in drying stock of different colors.

High-speed fans of the pressure type with newly designed airplane-type blades are used. The Aero-Therm unit used in the Hurricane dryers contains a direct-connected, motor-driven fan assembly, so designed that the fanshaft bearings and motor bearings are protected from the heat by an insulated sleeve, the bearings being accessible and outside of the heated enclosure. This complete assembly is removable as a unit. Exhaust fans are employed, and automatic control of the drying atmosphere is accomplished.

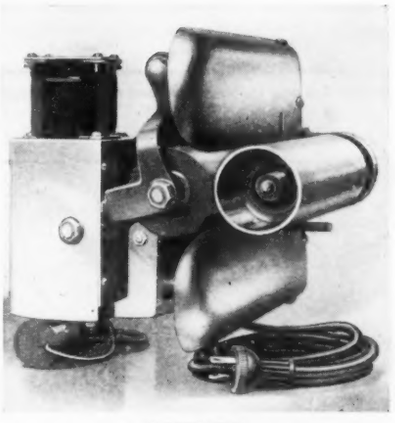
Extended-surface heaters with aluminum fins are now standard equipment. The conveying apron used in these dryers embodies new principles, which assure maintenance of a uniform width for carrying the raw stock.

The new Hurricane tenter dryer employs a new principle of recirculating the heated air many times through the fabric, and not merely across the surface. Push-button control has been perfected, so that the operative can start and stop the machine, change the speed of the conveyor, as required for different weights and kinds of cloth, and also adjust the machine for different widths of fabric—all without leaving his position on the platform.

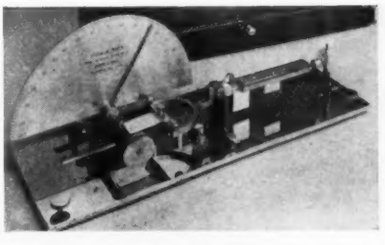
The Hurricane automatic loop dryer has also been improved. It is now equipped with turning poles which eliminate wrinkles, creases, and stick marks, and results in uniform and faster drying. The controlled air circulation is directed downward, and greater volumes of heated air are blown through the festoons of cloth without disturbing their position on the



FULLING

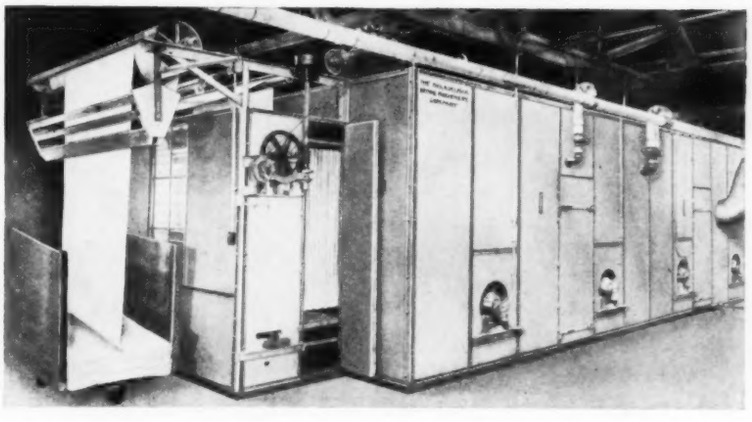


GUIDER



TESTER

DRYER

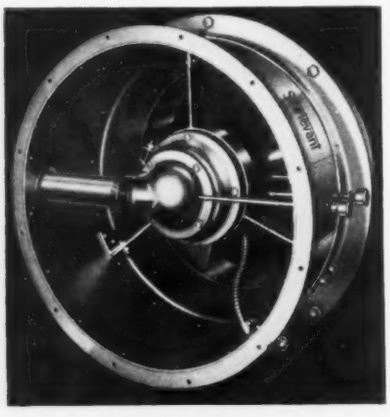


poles. Cooling and conditioning compartments may also be embodied in these machines.

High-speed vacuum extractors are now operating in range with tenters and other machines. They not only reduce the labor formerly required in handling the cloth, but permit uniform and thorough extracting throughout the entire width and length of the fabric, eliminating wrinkles and creases.

Slasher Exhaust Unit

• New exhaust units and systems for service in connection with slashers in cotton and rayon mills, have been developed by B. F. Sturtevant Co., Hyde Park, Mass. The unit may be used in size-box hood exhaust, drying-cylinder exhaust, and heating and vapor absorption. It utilizes a cast aluminum, three bladed propeller fan, designed for 54% static efficiency and for operation against high resistances. This fan is driven by a self-ventilated, direct-connected motor, cooled by an integral fan drawing cool room-air through a conduit connected to the outside of the unit. This fan and motor are mounted in a rigid casing, designed for ready connection to ducts and the exhaust stack. Two sizes



EXHAUST

are available: 23 in. diameter with capacity of 6,500 cu.ft. per min., and 33¼ in. diameter with capacity of 13,000 cu.ft. per min.

TWISTER CREEL

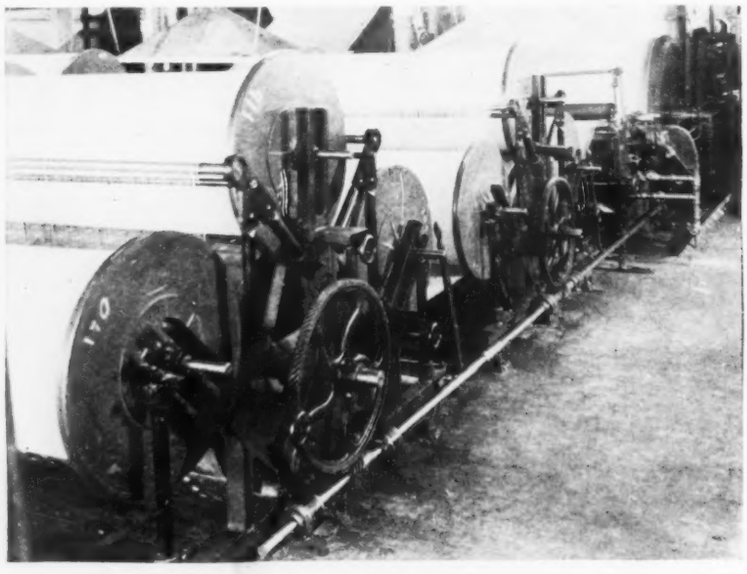
Twisting from Cheeses

• A creel permitting twisting from cheeses has been developed by Barber-Colman Co., Rockford, Ill. Due to their larger diameter, two cheeses are placed on each creel spindle, and a Bakelite skewer is available for holding the cheese on the creel spindle. No drag is required since the friction of the Bakelite skewer on the spindle is sufficient to prevent slack in the yarn and over-running when stopping. For finer yarns the skewers may be equipped with ball bearings and a drag applied to the surface of the cheese through a hinged metal stop. It is advantageous to twist direct from cheeses since they hold approximately twice as much yarn as the ordinary spool.

Driven Slasher Creel

• A new driven slasher creel built in 3-beam units is being offered by the West Point Foundry & Machine Co., West Point, Ga. The drive is taken off the side shaft of the slasher at the size box with a train of gears, one of which is a change gear, and is transmitted by a driven shaft through additional gear on the framework of the unit to a 36-in. cast-iron, cork-covered drum. The three section-beams rest on this drum, unrolling the yarn off the beam and delivering it to size box without any of the initial strain of the old style creel. Absorption of size is more uniform as the yarn enters the size box running slack.

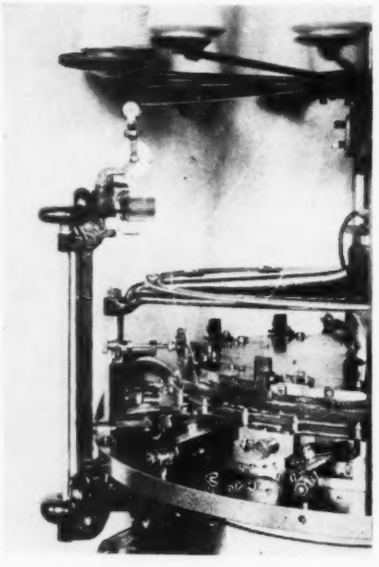
The drive is equipped throughout with ball bearings and is synchronized with the speed of the slasher, which permits uniform tension control and practically eliminates stretch. This system is known as the White yarn tension equalizer. It prevents breakage of yarn and consequent loose ends on loom beams. By installing additional 3-beam units, the capacity of the creel can be increased as needed. Each separate unit is equipped with a clutch that permits disengaging a surplus unit when running light sets or when creeling.



DRIVEN CREEL

Delivers Rubber for Knitting

• A new yarn-furnishing mechanism for facilitating the knitting of rubber yarn is offered by Wildman Mfg. Co., Norristown, Pa. The delivery of rubber yarn from its package is normally uneven and to obtain a good knitting condition it is essential



RUBBER FEED

that the yarn be fed to the knitting needles at a predetermined uniform tension. The new attachment employs the Wildman patented yarn-feeding mechanism that controls the yarn tension. Usually one end of rubber yarn is employed with two to twelve or more ends of regular knitting yarns. When using a few ends of rubber on a machine, only a small number of these attachments are required and they are easily applied.

Lap Winder

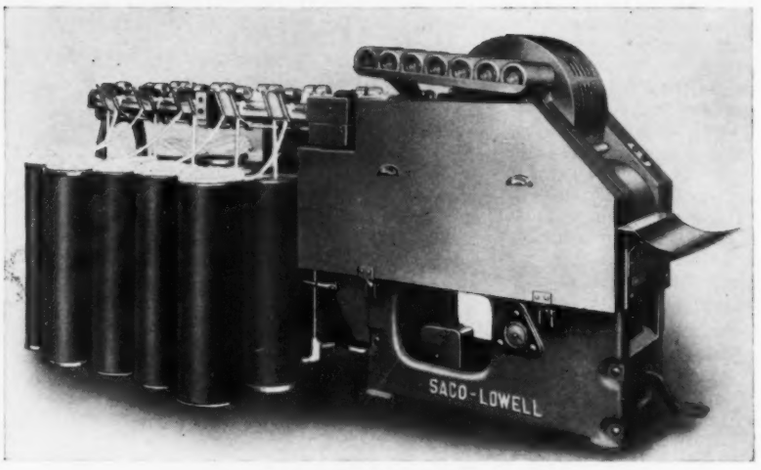
• Precision winding of laps is an important adjunct to the Saco-Lowell controlled draft drawing system. Saco-Lowell Shops, 147 Milk St., Boston, Mass., has put on market its Model 37 winder, new in design and planned to make a web of slivers, uniform in section, both transversely and longitudinally, and to roll this web into a compact lap of sufficient weight

to produce, after drafting, the exact quantity of sliver required to fill the roving can. This new lap winder has been built around its electrical drive and control box in such a way as to eliminate many of the small parts which have in the past been inherent in such winders.

The table section of the winder allows the use of full cans and is equipped with a stop motion which stops the sliver before the end has traveled 9 in. There is uniform tension on all slivers. Parts coming in contact with the sliver at the back of the table are nickel plated.

The calender section has been lowered for easier operation. It is fitted with a quick-acting, spool clamping mechanism, accurate hunting-tooth measuring motion, oversize bearings and hank clock. Highly polished rolls smooth down the fiber so that subsequent unwinding occurs without "licking" or splitting.

The periodic doffing operation is so nearly automatic that a lap can be doffed, it is said, in less than fifteen seconds. Model 37 lap winder is driven by a geared motor with the relatively slow speed of 273 r.p.m. permitting direct coupling by silent chain. The brake is capable of stopping the machine within a fraction of a second after the knock-off has operated. The machine is equipped with a safety hood, coupled with electrical controls in such a way that it is impossible to start until the hood is closed. It is said that this machine may be run at speeds 33⅓% higher than previous models. In addition to this gain in production, the quality of the lap, it is said, is all that can be desired.



LAP WINDER

Compressed-Air Bobbin Stripper

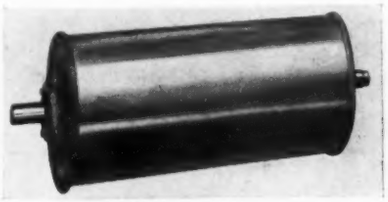
• A compressed-air bobbin-stripping machine has been recently developed by U S Bobbin & Shuttle Co., Lawrence, Mass. This machine requiring only one operator, is designed to strip from 3,500 to 3,800 bobbins per hour without injury to the finish of the bobbins. It is adaptable for use in stripping rayon bobbins and silk quills of all types and sizes, including paper tubes with metal or Bakelite bases. The stripper is operated by compressed air which forces the yarn down on the drum which is driven by an electric motor. The drum winds the yarn off the bobbins. The air pressure to operate the machine successfully, should be at least 40 lb. The majority of mills operate it on their own air systems, but where there are no air systems available, it is necessary to have a special compressor. The few bobbins with more yarn than this machine can clean in its normal speed of travel are placed by the operator on pegs on the side of the machine. The ends of the yarn are thrown over the bar and dropped on the drum which automatically cleans these bobbins.

STRIPPER

Stainless Steel Finishing Equipment

• Stainless steel is being fabricated for finishing plant equipment by S. Blickman, Inc., Weehawken, N. J. All seams are welded by recently developed processes which secure durability and appearance of one-piece construction. The seams are said to be as strong as adjoining surfaces.

The characteristics of stainless steel adapt it particularly for dry cans which Blickman supplies as shells or mounted on heads furnished customers. The material does not corrode, nor readily dent, score or scratch. It retains its smooth bright surface both inside and out thus facilitating transfer of heat to the textile passing over the cylinder. Jig tubs are also supplied of stainless steel with carefully rounded corners. So simple is the matter of cleaning that a color change is said to be a matter of minutes. The Blickman firm also makes a line of stainless steel vats, tubs and tanks for the textile industry and special work where required.



STAINLESS

NEW DYES & CHEMICALS

Permanent Water Repellent

Development of a new chemical for producing water-repellent finishes which are resistant to washing and dry-cleaning has been announced by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. While this product, known as DuPont Permanent Water Repellent, can be used on practically all types of textiles to give both water-repellency and a soft handle, it is more resistant to severe laundering on cotton and linen than on wool, rayon, or silk. As severe laundering is required as one step in the process of application, it is practical to use the finish only on undyed fabrics or on fabrics which have been dyed or printed with fast colors.

The new finish is applied to fabrics from a solution in water, using the usual padding equipment, after which the treated fabric is dried at moderate temperatures and heated at about 250° F. for a short time on any standard high-temperature drying equipment which operates at low humidity with good air circulation. The finish leaves the pores of the fabric open, thus permitting "breathing."

Due to the somewhat higher cost of the treatment, the new compound is not expected to replace the commonly used wax emulsions where the latter are satisfactory, but rather will supplement them in those fields where, due to frequent laundering, a truly permanent finish is desired. The permanent water-repellent is said to be particularly well suited for use on such fabrics as twills for summer military uniforms; draperies and curtain fabrics; slip covers; damask table cloths; house dresses and aprons; uniforms for nurses, maids, barbers, and soda-fountain attendants; children's dresses and play-suits; men's linen suits; raincoats; ski jackets, hunting coats, and other sports wear; and overalls and similar work clothing.

Warp Sizing Compounds

Three new warp sizing compounds, which are designed to take care of all the varying requirements of cotton mills, regardless of the type of fabric being made, have been announced recently by E. F. Houghton & Co., Philadelphia. These new products, which are known as Houghto-Size 10, 30, and 40, are described as highly concentrated products containing the minimum amount of moisture necessary to maintain stable mixtures of the component materials. They can be used in proportions as low as 5% on the weight of the starch.

Houghto-Size No. 10 is especially designed for gray goods, sheeting, drills,

plaids, coverts, etc.; it contains less than 1% of moisture. Houghto-Size 30 is a "one piece" product, containing the necessary gum in its component make-up; it is recommended particularly for sizing of ducks, gauzes, osnaburgs, tobacco cloths, denims, work cloths, etc. Houghto-Size 40 is basically a softener material containing no gum, and is designed especially for broadcloth and fine fabrics.

Advantages cited for the new products are that they give very measurable increase in warp breaking strength, high moisture regain, increase in elasticity, and less loss of elongation.

General Dyes

General Dyestuff Corp., 435 Hudson St., New York, announces the following new products; Supra Light Yellow GGL, a homogeneous, acid dye, yielding shades of excellent fastness to light, very good fastness to decatizing, and good fastness to carbonizing; since the new dye is discharge- resistant, it is suitable for producing colored discharge prints. Celliton Fast Pink FF3B, an acetate dye, yielding dyeings which are clearer and bluer than those obtained with Celliton Fast Pink F3B; the new product is suitable also for direct printing.

At A. A. T. C. C. Outing—Among those present at the recent Chattanooga outing of the South-Central Section of the American Association of Textile Chemists and Colorists were, left to right, Henry Gaede, Laurel Soap Co., Charlotte, N. C., Wm. J. Kelley, Jr., Burkhart-Schier Co., Chattanooga, Tenn., John L. McKee, Carbic Chemical & Color Co., Charlotte, N. C., Noel White (retired), Hermosa Beach, Cal., and E. H. Driver, American Cyanamid & Chemical Corp., Atlanta, Ga.

NEW PUBLICATIONS

Cotton Opening, Cleaning and Picking: by H. H. Willis and Vernette B. Moore; Textile Foundation, Washington, D. C.; multilithed copies obtainable from H. H. Willis, Clemson, S. C., at $1.50.

Just a few years ago we had occasion in these columns to lament the lack of an American cotton-manufacturing literature. In 1932, however, came Professor Gilbert R. Merrill's "Cotton Opening and Picking," and three years later arived his "Cotton Drawing and Roving." Last year H. H. Willis, dean of the Textile School of Clemson College, Clemson, S. C., in collaboration with Vernette B. Moore, introduced through the Textile Foundation an excellent book entitled "Cotton Carding;" and this year the same collaborators, in the same way, bring forth "Cotton Opening, Cleaning, and Picking." It is to be regretted that they did not choose a subject not already well covered; but perhaps we should take comfort in the fact that this volume is one of a complete series to be sponsored by the Foundation and intended eventually to cover all cotton-manufacturing operations.

"Cotton Opening, Cleaning, and Picking" is the introductory book of the series; and, wisely, it begins with a pictorial review of the major processes from ginning through weaving, with brief captions explaining the purpose of each. Then it delves into a lengthy, detailed, step-by-step description of the picker-house operations, supplemented by chapters on waste, draft and production calculations, raw-stock oiling, humidity, work loads and duties of employees, and pulley and gear calculations. The numerous illustrations consist mainly of machine builders' photographs and diagrams.

There are a number of things we particularly like about the book. It does not accept without question the claims that are made for this or that process, as in the case of the chapter on cotton oiling. It urges the reader to seek the scientific solution of problems, as in the assignment of a definite work load per operative. Finally, and we may be a little self-interested in selecting this point for mention, it urges superintendents, overseers, and students to read their trade journals faithfully. These are just a few of the many evidences that the book is intelligently written.

Davison Textile Blue Book; Davison Publishing Co., 50 Union Square, New York; office edition, $7.50, and handy edition, $5.00.

This annual directory of the textile industry for 1937 has been issued. All mills are indexed alphabetically and mill data appears in six major subdivisions—cotton, woolen, rayon-silk, knitting, dyers and Mexico-Canada. Dealers in raw materials, yarns, wastes, etc., are listed.

NEWS OF SUPPLIERS

• **Universal Winding Co.,** Providence, R. I., announces that Edward O. Smith, vice president, recently sailed on the Normandie on a business trip to England and the continent.

• **Brown Instrument Co.,** a division of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa., manufacturers of industrial recording and control instruments, announces appointment of E. B. Evleth as vice-president and general manager.

• **Manhattan Rubber Mfg. Division of Raybestos Manhattan, Inc.,** Birmingham, Ala., announces that Chas. P. Shook, Jr., who has been 20 years with the firm, has been named assistant manager; part of his time will be devoted to development of new business.

• **G. Woolford Wood Tank Mfg. Co.,** Darby, Pa., has just completed a new office building there, the interior of which was designed to display the various woods most popular in Wood tank construction.

• **Steel & Tubes, Inc.,** subsidiary of Republic Steel Corp., Cleveland, Ohio, has opened a branch office in Baltimore, Md., it has been announced by L. W. Harston, vice-president in charge of sales. H. H. Smith is in charge of the new office and will handle the entire line.

• **Worthington Pump & Machinery Corp.,** Harrison, N. J., announces the appointment of W. A. Neill as manager of engineering and sales activities at its recently reopened plant at Holyoke.

• **The International Nickel Co.,** New York, marks the National Metals Congress, which opens Oct. 18 at Atlantic City, by issuing an analysis of 1937 progress in metallurgical practice. The analysis cites a wide range of new uses for nickel steels, cast irons and steel alloys, describing the application of these materials to many industries.

• **Vitex Laboratories, Inc.,** subsidiary of the National Oil Products Co., Harrison, N. J., announces that Raymond F. Peasback, director of merchandising, advertising and sales promotion, has been appointed director of advertising and sales promotion of the Agricultural Division, in addition to his present duties.

• **The Connecticut Blower Co.,** Hartford, Conn., announces that Charles H. Keeney, who prior to 1928 was connected with them for 18 years, has again become associated with the company as general manager and chief engineer.

• **Warwick Chemical Co.,** New York City, announces the engagement of Miss Diana Johns as fashion and promotion

director for Impregnole process, a water repellent and stain, spot and perspiration resistant finish for fabrics of all kind. She will work with Harold W. Rose, general sales manager.

• **Hercules Powder Co.,** Wilmington, Del., announces that an office of its naval stores department has been opened in the Johnston Building, at Charlotte, N. C. Frank U. Rapp, with headquarters at the new office, is Southern representative.

• **Cutler-Hammer, Inc.,** Milwaukee, Wis., announces the appointment of Joseph Gardberg as manager of their new office in New Orleans, La. Mr. Gardberg is a graduate of Georgia Tech, has had years of experience both as a consulting engineer and in various other technical circles of the electrical industry. The new office operates under the jurisdiction of A. C. Gibson of the Atlanta office. The appointment of W. E. Ragsdale as manager of the Dallas, Texas, office also is announced by the company.

• **A. E. Staley Mfg. Co.,** Decatur, Ill., announces that L. A. Dillon has been made assistant southern sales manager, with Atlanta, Ga., (1710 Rhodes-Haverty Building) as his headquarters. For the last few years, Mr. Dillon has been a district manager in Ohio, West Virginia and Pennsylvania.

C. A. Carrell

• **Acme Steel Co.,** Chicago, Ill., through F. H. Webb, manager of its Atlanta office, has announced the appointment of C. A. Carrell as sales representative in Georgia. He will take up the sales and service duties performed by the late Hugh Duane. Mr. Carrell lives in Atlanta and has been associated with Acme Steel Co. for 17 years.

• **New York Power Transmission Club** and the **North Jersey Power Transmission Club** held their 3rd annual banquet Sept. 10, at the Hotel Astor, New York. Principal speakers were J. H. Van Deventer, editor *Iron Age;* and Victor A. Hanson, chief engineer, Power Transmission Council. Mr. Van Deventer, speaking on the subject "New Economic Problems Create New Opportunities," stated that a trend in industry today is to make economies in the line of power generation, power transmission, and similar fields, rather than in direct productive costs. Mr. Hanson outlined the way in which power-consumption studies should be made in industrial plants to determine what type of drive is best suited for each kind of equipment. In many instances, according to the speaker, use of modern group drive will result in savings of 50% in investment cost and large savings in power and operating costs; as a rule, group drive proves most advantageous in the case of machines which operate on an economically constant load. Charles E. Brinley, American Pulley Co., acted as toastmaster.

• **Stein, Hall & Co., Inc.,** New York, have established a new laboratory at Providence, R. I., fitted out with complete and modern equipment for the scientific solution of sizing, printing, and finishing problems. The work will be in charge of F. C. LaPiana, assisted by David Truax. Frank W. Perry will be the resident chemist. All have had a wide experience in the textile industry.

• **Diamond Alkali Co.,** Pittsburgh, Pa., has appointed George S. Cooper as vice-president in charge of sales.

Textile World Analyst

TEXTILE WORLD's index of textile mill activity for the first eight months of 1937 shows a rate 17% above that for the corresponding months of 1936 and 35% above the first seven months of a "normal" year (1924-31 average). August activity was slightly (1%) over that of August last year. . . . Of the individual fibers, cotton consumption for the first seven months of 1937 was 20% above 1936; wool 10% up; and silk and rayon each 5% up. . . . Carded fabric and yarn margins declined sharply in the middle of September but regained a small part of the loss before the end of the month (Tables I and II). . . . TEXTILE WORLD's price index numbers in both the cotton and wool series declined for the month.

Textile World's Price Index Numbers

STARTING with January, 1936, TEXTILE WORLD has revised its price index numbers to a 1923-25 base, to correspond with current statistical practices. Those who wish to continue with indices based on July 1, 1914, for chart purposes or otherwise, can secure conversion factors to change the new figures to the old by writing TEXTILE WORLD, Statistical Dept., 1427 Statler Bldg., Boston, Mass. Figures on cotton manufactures, Aug. 1, 1933 to Jan. 6, 1936 include processing tax.

	Cotton Index Numbers				Wool Index Numbers				Silk Index	Rayon
Date	Cotton	Yarns	Gray	Colored	Wool	Tops	Yarns	Cloth	Raw-Silk	Index
1923-25	100	100	100	100	100	100	100	100	100	100
1930 ave.	50	61	61	72	58	61	72	90	109	46
1931 ave.	32	68	46	59	46	49	59	71	32	32
1932 ave.	24	37	37	60	36	40	52	57	21	28
1933 ave.	39	56	55	50	53	59	62	80	21	26
1934 ave.	61	67	70	62	63	70	75	91	17	25
1935 ave.	60	68	67	69	56	58	70	88	22	24
1936 ave.	45	63	63	68	72	78	76	93	23	25
Jan. 1936	48	67	63	68	67	73	75	93	26	24
Feb. 1936	42	62	58	67	72	81	77	93	24	24
Mar. 1936	42	61	57	66	73	81	77	93	23	24
Apr. 1936	43	60	55	64	68	75	76	90	22	24
May 1936	43	57	54	64	67	75	76	90	21	24
June 1936	44	58	57	65	67	75	76	90	20	25
July 1936	48	61	61	70	69	75	75	90	22	26
Aug. 1936	45	62	63	70	70	75	74	90	23	26
Sept. 1936	45	62	63	70	70	75	74	90	22	26
Oct. 1936	45	64	67	71	71	75	74	92	23	26
Nov. 1936	45	65	74	72	78	82	76	100	26	26
Dec. 1936	48	72	80	74	87	90	84	105	26	26
Jan. 1937	48	73	81	76	90	93	88	108	27	26
Feb. 1937	48	74	78	76	90	92	90	108	27	26
Mar. 1937	52	78	80	78	87	88	90	112	27	26
Apr. 1937	53	80	82	80	84	86	90	112	27	27
May 1937	49	75	76	78	82	84	89	112	24	27
June 1937	47	70	71	78	78	82	88	112	25	27
July 1937	45	65	67	78	78	82	88	112	26	27
Aug. 1937	37	59	62	78	80	82	88	112	25	27
Sept. 1937	33	54	56	73	78	81	87	107	25	27

Fabric and yarn manufacturing margins follow:

TABLE I. CARDED FABRIC MARGIN

Date	Margin in cents	Date	Margin in cents
August, 1933..	21.4	March, 1936...	15.5
October, 1933.	19.1	April, 1936....	14.3
January, 1934	18.4	May, 1936.....	14.3
April, 1934...	17.6	June, 1936.....	15.3
July, 1934....	15.5	July, 1936.....	16.9
August, 1934..	16.6	August, 1936..	18.0
September, 1934	18.6	September, 1936	18.4
October, 1934..	17.4	October, 1936..	21.2
November, 1934.	15.8	November, 1936	25.4
December, 1934.	16.2	December, 1936.	28.1
January, 1935..	16.2	January, 1937..	28.6
February, 1935.	16.0	February, 1937.	26.2
March, 1935...	15.9	March, 1937...	25.6
April, 1935....	16.1	May 1937.....	23.1
May, 1935.....	16.0	June, 1937....	21.2
June, 1935.....	16.5	July, 1937....	20.1
July, 1935....	15.2	August, 1937..	19.4
August, 1935...	17.1	Sept. 1937....	18.1
September, 1935	17.9		
October, 1935..	17.7	Sept. 1...	18.8
November, 1935.	16.4	Sept. 8...	18.4
December, 1935.	16.2	Sept. 15...	17.5
January, 1936..	17.2	Sept. 22...	17.8
February, 1936.	16.5	Sept. 29...	18.0

TABLE II. CARDED YARN MARGIN

Date	Margin in cents	Date	Margin in cents
August, 1933...	23.5	March, 1936...	16.3
October, 1933..	20.0	April, 1936....	15.6
January, 1934..	18.3	May, 1936.....	14.8
April, 1934....	15.9	June, 1936.....	14.6
July, 1934.....	14.7	July, 1936.....	15.0
August, 1934...	15.3	August, 1936..	16.5
September, 1934	15.6	September, 1936	16.5
October, 1934..	14.6	October, 1936..	17.2
November, 1934.	13.5	November, 1936	18.0
December, 1934.	13.5	December, 1936.	20.6
April, 1935....	14.1	January, 1937..	20.8
September, 1935	15.4	February, 1937.	21.2
October, 1935..	15.8	March, 1937...	21.3
January, 1935..	13.5	May, 1937.....	21.2
February, 1935.	13.9	June, 1937.....	19.3
March, 1935...	14.4	July, 1937.....	17.8
May, 1935.....	13.8	August, 1937..	17.2
June, 1935.....	14.5	Sept. 1937....	16.1
July, 1935.....	14.3		
August, 1935..	15.3	Sept. 1...	16.7
November, 1935.	16.3	Sept 8...	16.0
December, 1935.	16.3	Sept. 15...	15.7
January, 1936..	18.4	Sept 22...	16.0
February, 1936.	17.5	Sept. 29...	16.0

Cotton Digest

AN eleventh birthday doesn't rate in importance compared with a tenth, even though the celebrant is one year older, and presumably wiser. Consequently, the Cotton-Textile Institute must content itself with less of the tumult and the shouting at its annual meeting Oct. 27 than featured its tenth anniversary last year. However, it faces no less responsibility in the year ahead. Realization of this fact was evidenced in Dr. C. T. Murchison's report, to members, on the legislative outlook for the next session. Wage - hour legislation, corporation tax revision, and crop-control legislation are three of the major problems which will demand the Institute's attention. Its constructive service in Washington during the last year is an earnest indication of more to come.—*Editor.*

World Consumption Cotton Up 14%—An increase of 14% was noted in world cotton consumption for the year ended July 31 as compared with the preceding year, according to preliminary results of an international cotton census taken by the International Cotton Federation of Manchester. World spinning spindleage, compared with Jan. 31, shows a slight decline. Year's consumption was put at 29,026,000 bales against 25,389,000 bales the previous year. The increased use of cotton was general in the major countries of the world including United States, Great Britain, Russia, France, India, Japan and China. Wars in Spain, Italy and China made estimates for those countries rather uncertain.

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Fred Butterfield & Co. To Cease Operations—Fred Butterfield & Co., New York, century-old textile converting house, will cease operations at the close of the present fall season, it was recently made known by Charles Pinnell, president. The business is being liquidated under the direction and in the interests of the stockholders. All commercial indebtedness has been fully cleared up, it was said. Normandie voiles, one of company's well-known lines, will in the future be distributed to the retail trade by Arthur Beir & Co., and to the cutting up trades by Arnold Sales Corp. Arnold Print Works will make the goods.

•

S.T.A. Divisional Meetings—Gaston County Division of the Southern Textile Association met Sept. 24 at Gastonia, N. C. Eastern Carolina Division met Oct. 9 at West Durham, N. C., and recently organized Western South Carolina Division (formerly spinners and weavers divisions) is scheduled to meet Oct. 23 at Greenville, S. C. An account of the Gaston County meeting is published in the *Overseers' Corner* of this issue. Details of the other meetings will be carried in succeeding issues.

•

Markets Resist Slightly—There was light movement of gray cloth of all kinds during September, and the average was better than for the two previous months. Prices declined with the drop in cotton quotations, and several large groups announced curtailment programs. This was interpreted to mean that mill margins were getting painfully thin. At the close of the month 5c. was being asked for 38½ in., 64x60, 5.35 print coth. A bright spot was increased foreign interest in American cloths. A fair amount of yarn was sold during September although prices were generally low. Mercerized yarns were reduced 2 to 3c. per lb. Falling cotton prices were reflected in the yarn market also.

•

Report on Mill Margins—A report on cotton prices, cloth prices, and mill margins covering seventeen constructions of coth over a period of years has just been issued by the Bureau of Agricultural Economics. It contains data showing prices and margins by months since 1925–26. Margins last season were the highest in twelve years, averaging 16.60c. as compared with a low of 9.43c. for the 1931–32 season. High was 18.41c. in October, 1925, and low was 7.65c. in July, 1932.

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Yarn Merchandising Program Planned—Preliminary steps toward setting up the machinery for formulating a set of rules to regulate the merchandising of carded and combed yarns were recently taken at Charlotte, N. C., at a meeting of the Carded Yarn Group. A committee was appointed to work on the rules and to collaborate with a similar group, representing the combed-yarn spinners. The committee of carded and combed-yarn spinners consists of Hyman L. Battle, Rocky Mount, N. C., and R. L. Harris, of Roxboro, N. C., representing the carded group, and Harold Lineberger, Belmont, N. C., and A. K. Winget, Albemarle, N. C., representing the combed group. J. C. Roberts, Gastonia, N. C., is the fifth member and representative of both branches. Ex-officio members are Don P. Johnston, E. O. Fitzsimmons, R. D. Hall and Fred Allen.

•

Foreign Trade Statistics—Imports of cotton fabrics during July, according to the Department of Commerce, were as follows: unbleached, 280,569 sq.yd. valued at $65,048; bleached, 6,595,120 sq.yd. valued at $461,436; printed, dyed or colored, 3,700,668 sq.yd. valued at $541,022; tapestries, jacquard, etc., valued at $118,629; table damask and manufactures valued at $118,284; covers, scarfs, napkins, etc., valued at $108,795; bedspreads and quilts, 274,160 pieces valued at $193,116; sheets and pillow cases, 91,242 pieces valued at $15,744; velvets and velveteens, 536,863 sq.yd. valued at $95,462; exports of plushes amounted to 15,896 sq.yd. valued at $14,640.

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Weekly Cotton Reports—Weekly reports covering grade and staple of cotton classed throughout the cotton area were begun by the Department of Agriculture last month.

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Key Cotton Prices with usual comparisons follow:

	Oct. 1, 1937	Sept. 1, 1937	Oct. 1, 1936	Oct. 1, 1935
Spot Cotton N. Y.	8.55	9.29	12.64	11.05
Ditto, high previous month	9.56	11.35	12.63	11.10
Ditto, low previous month	8.46	9.38	11.87	10.65
10s hosiery cones	21	23½	25½	28½
10s/2 carded skeins	22	22	25½	27
20s/2 carded peeler warps	24½	32	29½	30½
60s/2 combed peeler warps	52	54	55	56
60s/2 mercerized cones	67	72	68	70
37 in., 3-yd. drill	7¼	8½	9	9¼
38½-in. 64 x 60s	5	5½	6½	6½
36-in. 4-yd. 56 x 60s	6¼	6¾	7 7/16	7¼
Denim, 2.20s	15	16	13½	15

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Statistics of particular interest to cotton manufacturers showing August operations and the raw material situation:

	August	July
Spindle activity (% capacity)	130.5	121.9
Spindle activity (millions of hours)	8,184	7,665
Cotton consumed (bales)	604,380	583 966
Cotton exported (bales)	220,415	124 312
Cotton imported (bales)	8,458	18 960
Ginned to Sept. 16 (bales)	4,266,617	

Cotton

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TEXTILE WORLD'S

Wool Digest

THE result of the CIO vote in Wood and Ayer mills of the American Woolen Co. might easily have been made the basis for price advances by the company. The fact that spring lines were opened, subsequent to the election, at parity with or below values set on fall goods last March reveals a determination on the company's part to trim profits in order to start the season on a rock-bottom basis. It is true that present uncertainty involving both the course of business in this country and international price levels makes any safe prediction difficult. However, buyers at least had the assurance that, so far as was possible, a sound basis was set in this particular instance.—*Editor.*

TWOC won election at the Wood and Ayer Mills of American Woolen Co., Lawrence, Mass., by 4,425 against 2,302 at Wood and 1,389 against 946 at Ayer. This officially established the CIO affiliate as the bargaining agent for these two plants. Conferences are underway between union, employee and employer representatives with the view of laying groundwork for an agreement. The workers as a whole will have opportunity to vote on the agreement it is said.

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TWOC is now seeking elections at the Arlington and Pacific Mills in Lawrence. Cleveland Worsted Mills Co. ended the 14-week strike at their Redfern Mill when the union members accepted the contract offered by the company; the Annevar mill reopened on limited scale after 13-week strike. Election at S. Stroock & Co., Newburgh, N. Y., Sept. 29, voted against recognition of the CIO union. The TWOC has been active in working with Bigelow Sanford and Mohawk in the carpet field. TWOC has filed charges against William H. Grundy Co., Bristol, Pa., with the National Labor Relations Board, alleging refusal to bargain collectively.

•

Regular spring, 1938, men's wear lines have been opened at prices par to slightly lower than the last previous opening (that for fall 1937). New prices are 10 to 12½c per yard lower than the advanced levels reached by fall goods, but are higher by 15 to 30c than levels named for last spring a year ago. The larger reductions from recent levels are reported on staple worsteds; fancy worsteds are in many cases unchanged; on woolens, comparisons are difficult because constructions vary. Sellers argue that willingness to go back to last March levels after the TWOC vote in Lawrence suggested a lightening of labor costs, indicates their desire to set a bottom figure in which buyers may have confidence. Openings were made during the week of Sept. 20, but as October opened buyers had done little but sample the lines. Market is dull and mills are beginning curtailment as backlogs dwindle. It is estimated that the men's wear backlog is under 10,000,000 yd., against 25,000,000 a year ago and higher figures early last spring.

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Women's wear trading was more brisk at the end of September than for several weeks. Cutters find their stocks inadequate and are in the market for a wide variety of fleeces, worsted coatings, dress fabrics and mannish fabrics for suits. Unfilled orders for women's wear show a better situation than do similar figures in men's wear. The women's wear backlog amounts to 8,000,000 yd. against 6,500,000 yd. a year ago.

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A few spring prices typical of the market follow: American Woolen Co.—serge 9641, $1.82½; unfinished worsted 9813, $2.12½; fancy worsted 9081, $2.05; woolen suitings, 77½c to $2.15; top coatings, $1.02½ to $2.67½. J. P. Stevens & Co.—worsted 838, 13-13½ oz., $2.15; rayon-wool 845, 13½-14 oz., $1.80. L. Bachmann & Co.—fancy worsted 96, 13 oz., $2.15.

•

N.A.W.M. Holds to F.O.B. Mill—The request of representatives of New York clothing manufacturers, sent to the National Association of Wool Manufacturers, for goods to be delivered f.o.b. New York, for seasonal dating and extended terms, and for other changes, should not be granted, according to recommendations of the special committee and the executive committee of the association. The decision of the committees is contained in a report sent by Arthur Besse, association president, to members.

•

Palm Beach clothing is set to retail at $17.75 in 1938 which means a $1.00 advance over 1937. It is predicted that 50% of next year's business in these suits will be in stripes, 40% solid colors and 10% checks and plaids. The wholesale price is up 75c being at $10.75 against $10 last season.

•

English mill stylers are still showing plaids and overchecks in worsteds although the Glen plaid seems to be fading out to a considerable extent, says a European correspondent. Overchecks 1½ to 2 in. in a variety of colorings are popular in mill-finished and West of England types. Gray still leads in these fabrics followed by a wide range of blues. The dusty blues with over-tones of reds and greens are particularly strong. In woolen fabrics color runs riot, browns, tans, grays, and greens, each in its full range. For country wear there are the Donegals and the Shetlands, cheviots and tweeds, in fairly firm and in looser weaves. Greens are gaining in importance in this category with browns coming second.

•

Wool imports for first half of 1937 totaled 238,400,000 lb. of which about one half was apparel wool. This quantity was 90% higher in volume and 170% higher in value than wool imports for similar period the year previous. Wool has taken the lead from silk as the largest item in textile raw material imports.

•

"Tropical suits" is said to be the description which clothiers may apply next season to the garments made of the popular 80% worsted-20% cotton construction, since the Federal Trade Commission frowns on description as "Tropical Worsteds" unless the fabric is all wool.

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Wool tops went lower as September progressed although trade continued fairly brisk, closing August at $1.14 and opening September at $1.10½, the New York Exchange spot price went to $1.08½ on Sept. 17, and to $1.07 on Sept. 24. The latter was a new low for the year as a whole. Oct. 1 price—$1.06.

•

Key wool prices with usual comparisons, follow:

	Oct. 1, 1937	Sept. 1, 1937	Oct. 1, 1936	Oct. 1, 1935
Fine and fine med. territory	$0.93	$0.97	$0.85	$0.68
Ohio ⅜s	.43	.44	.39½	.34½
Tops fine 64-66s	1.14	1.18	1.09	.99
Average ⅜s	1.03	1.05	.98	.86
High ¼	.98	1.00	.90	.78½
Noils, fine	.73	.75	.68	.62
¼	.58	.58	.55	.47½
2-40s 60s wstd yarn	1.77½	1.80	1.52½	1.45
S020 serge	2.15	2.27½	1.82½	* * *

•

Current statistics on wool consumption and mill activity:

	August (4 weeks)	July (5 weeks)
Wool consumed, cl. a.s equir.		
Apparel wool, lb	20,044,000	20,510,000
Carpet wool, lb	8,668,000	7,905,000
Machinery activity (40-hr. shift)		
Looms (50-in. and wide)	93.0%	92.5%
Carpet looms	76.4%	62.6%
Combs	110.4%	104.2%
Worsted spindles	73.4%	70.4%
Woolen spindles	113.1%	101.6%

Wool

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TEXTILE WORLD'S

Rayon & Silk Digest

THE annual awards of the American Trade Association Executives represent a real gauge of progress in association activities. Consequently the National Federation of Textiles can derive satisfaction from the honorable mention it has just received in this year's awards. The particular service for which the Federation was honored—its success in preventing design piracy—is one which will appeal especially to those who know the degrading effects of that trade practice. . . . Personal reference should be made to Miss Irene Blunt, secretary of the Federation who, as director of the Design Registration Bureau since its inception, has been responsible for so much of its progress.—*Editor.*

Yarn Market Quiet—Current steps being taken by weavers to curtail rayon fabric production have resulted in an appreciable let-up in ordering of yarn. The lull has been welcomed by producers as permitting them to catch up with orders. Small stocks of yarn are accumulating.

•

Velvets Active—Transparent velvets of the crush-resist type were in active call this month, the market having adjusted to the September price advance which sent quotations up from $1.35 to $1.45 per yd.

•

High Cost of Strikes—Up to September, the TWOC has spent nearly $75,000 in financing the recent strikes at the Covington, Va. and Cleveland, O., plants of the Industrial Rayon Corp., according to testimony given by Robert Gaffney, CIO organizer at a contempt hearing in the Circuit Court at Covington.

•

Staple Price Reduced—Following the lead of the Rayon Division of the E. I. du Pont de Nemours & Co., most producers and distributors of staple fiber have now unofficially lowered their prices. According to the new Du Pont list, bright staple sells at 25c against the old price of 28c and dull staple now sells at 27c. No other firms have announced price changes, but it understood that the new levels have become generally effective.

•

Holds "Velvet" Means Silk—Holding that the term "velvet" implies 100% silk content, the Better Business Bureau of Chicago has advised retailers there that when the term applies to fabrics having non-silk content, this should be indicated in all advertising. The decision caused considerable surprise in the New York market where the term "velvet" has long been viewed as describing construction irrespective of fiber.

•

Magazine Proposed Silk Boycott—In an editorial which criticizes Japan for invading China, *The Nation* of Oct. 2 proposed a boycott by American consumers of Japanese goods, especially silk, as a method of protest. The editorial urges that the boycott be undertaken by "women's peace organizations, trade unions and all other groups desirous of preventing another world war."

•

Japan Regulates Silk Price—With a view to stabilizing silk prices the Japanese Government has set 950 yen as the "roof" price for selling and 520 yen as the "cellar" price for buying silk in the Japanese market. Addressing a press luncheon in New York Sept. 27, Tokehiko Uyeda, newly appointed head of the Japanese Government Raw Silk Intelligence Bureau here, said that this step was supported by the government with its holding of 50,000 bales of raw silk and its fund of 70,000,000 yen.

•

Rayon Fabric Data—Rayon woven fabric deliveries in August were virtually unchanged from July, according to figures made public by the National Federation of Textiles and the National Rayon Weavers Association. The index of deliveries for August, 1937, was well below that for August, 1936. August, 1937, deliveries of dress goods and novelties were slightly above July, which the joint statement interpreted as indicating that the season's peak will be later this year. Key figures for the month follow:

1934 = 100	August 1936	July 1937	August 1937
Taffetas, Twills, Linings and Other Staples...	262	254	254
Dress Goods, Novelties, and Other Fancies..	125	97	99
Total	173	152	152

•

Lull Weakens Silk Prices—Raw silk quotations weakened considerably during the last month. Crack double extra 78% 13/15 white which had closed Aug. at $1.83½ had fallen to $1.74 on Sept. 24. Importers complained that the expected pick-up in demand from hosiery firms had failed to materialize and they said there was little prospect of any price improvement until some interest is shown among consuming industries. Weavers bought little or no raw silk during September.

•

Acetate Glove Market Widening—News that a leading distributor had announced a new line of gloves made of woven acetate yarn, was received with much interest in the market this month. The gloves are made on machines recently imported from Europe and it is suggested the product may stimulate wider interest in acetate fabrics among glove manufacturers.

•

Acetate Staple Economical for Wool Mixtures—Recent developments in combining acetate staple with wool in fabrics have brought up an economy argument favorable to acetate, it is reported. While normally acetate staple at 52¢ per lb. is seriously at a disadvantage against viscose staple, at 28¢, it is contended that the acetate, because of its character, can be used in much higher percentages when mixed with wool than can viscose staple, thus reducing the ultimate cost of the fabric.

•

Rayon Tubing Active—Rayon yarn producers reported a stronger position among their customers who knit circular underwear fabrics. This fabric market was slow in early August and caused a slackening of yarn orders, but demand improved appreciably later and September opened encouragingly.

•

Key rayon prices and statistics follow:

Prices	Oct. 1, 1937	Sept. 1, 1937	Oct. 1, 1936	Oct. 1 1935,
Viscose process				
75 denier (18–30 fils.).....	$0.93	$0.93	$0.90	$0.87
100 denier (40 fils.).....	.82	.82	.79	.76
150 denier (40 fils.).....	.63	.63	.60	.57
Acetate process				
150 denier.....	.63	.63	.60	.60
Cupra. process				
150 denier (112 fils.).....	.68	.68	.65	.62
Rayon staple, bright, 1½, 3 and 5½ den.....	.25	.28	* *	* *

Indices of Deliveries*

Month	Sept.	Aug.	July
In year 1937.....	000	530	511
In year 1936.....	537	633	614

* "Rayon Organon," exclusive of Acetate. Daily average 1923–1925 = 100.

Key silk prices and statistics follow:

Prices	Oct. 1, 1937	Sept. 1, 1937	Oct. 1, 1936	Oct. 1 1935
Crack XX 13/15 white 78%.	$1.69½	$1.78½	$1.71½	$1.96
Tram, 5thd Japan 85%.....	2.55	2.75	2.40	2.67½
Tram Crack XX 78%.....	2.38	2.43	2.29	2.50
60s-2, spun silk.....	3.15	3.15	2.95	2.95

Statistics	Imports	Approximate deliveries	Stocks at warehouses
Sept., 1937.....	36,146	36,372	43,957
August, 1937.....	36,246	33,557	44,183
July, 1937.....	27,337	31,399	41,494

Rayon & Silk

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TEXTILE WORLD'S

Knit Goods Digest

THE hosiery industry has had excellent opportunity to formulate its policies this fall. The meeting of the Southern Hosiery Manufacturers Association last month and the two-day conference of the National Association of Hosiery Manufacturers this month gave all groups a chance to get together. The continuing contact between the two organizations—as instanced by the report on the Davis elastic top patent presented to the seamless group at the National meeting by a sub-committee of the Southern association—insures maximum return from these conferences. This industry has definitely learned how to extract the most good out of group action.—*Editor.*

August Hosiery Sales Rise—Hosiery shipments in August were 14.3% above July but slightly below August, 1936, according to figures made public by the National Association of Hosiery Manufacturers. It was also noted that total shipments for the first eight months of this year were 11.2% above the same period last year. An interesting point was the rise in anklets of which 16,652,519 doz. pr. were shipped during 1937 against 13,639,021 in 1936, an increase of 22.1%. Knee-lengths rose from 211,850 doz. pr. shipped in August, 1936 to 242,831 in the current August.

•

Two-Ply Hosiery Patent Snarl—The pending controversy over patented elastic tops in seamless plus the appeal of the ringless hosiery patent decision gave hosiery buyers two more problems to worry about this month. The effect on September buying was to make customers especially cautious and to increase the number of requests for guarantees by mills against possible litigation.

•

Hosiery Fall Buying Slow—Fall buying of both full-fashioned and seamless hosiery did not pick up as quickly as expected, according to New York trade leaders at the end of September, firms were giving considerable thought to advisability of curtailment. Generally, hosiery prices held up fairly well, one exception being men's all-cottons which were selling at the year's low levels.

•

A Brief for Brands—Branded merchandise manufacturers must always maintain quality because of the personal responsibility involved, stated Arthur R. Kneibler, vice-president of Coopers, Inc., and inventor of knitted shorts, recently. In a "Brief for Branded Merchandise" distributed to his sales force, this well known underwear manufacturer said the unbranded manufacturer is apt to stress volume alone.

•

Wages Up 5 to 7%—Various important hosiery mills announced wage increases during September; most of the increases were between 5% and 7%. The Allen-A Co., Kenosha, Wis. stated that a 7% raise had gone into effect among its 900 knitters there, to bring the rates into line with hosiery wages in other parts of the country. Approximately equal advances had been made in Philadelphia a short time before.

•

Hosiery Program—The program of the Hosiery Industry Conference in New York, Oct. 14–15 will include talks by H. W. Brightman, of L. Bamberger and Co., Newark, N. J., on marketing; Wm. H. Gosch, president of the association as chairman, Arthur D. Whiteside, president, Dun & Bradstreet, Inc., on readjustment in management, John Wyckoff Mettler, of Interwoven Stocking Co., and others.

•

Keystone Group Elects—John H. Vogt, president of Nolde & Horst Co., on Sept. 29 was elected president of the Keystone Hosiery Manufacturers Association, composed of hosiery manufacturers in the Reading, Pa. area. Dr. John C. Evans, of Albright College, was appointed labor arbitrator for the group.

•

Kaufman Decision Appealed—Julius Kayser & Co. and the Textile Patents Corp. have filed an appeal with the U. S. Circuit Court of Appeals against the recent decision of the Federal District Court, Philadelphia, which ruling invalidated the Kaufman or 3-carrier patent and dismissed the suit against Rosedale Knitting Co.

•

Outerwear Group on the Warpath—Continuing its drive against allegedly improper advertising of knitwear, the National Knitted Outerwear Association last month objected to the practice of a New York store in advertising as "cashmere" a group of sweaters which contained 27% wool. Conferences with the store management followed and the retailer agreed to specify percentage of yarn types in advertising hereafter.

•

Push Underwear Rules Action—The Federal Trade Commission recently was asked by Roy A. Cheney, managing director of the Underwear Institute, to expedite the program for hearings on the Institutes's proposed trade practice rules. In reply the commission advised that recommendations as to wording of rules would be submitted to the institute shortly.

•

Underwear Prices "Too Low"—Urging higher underwear prices to equalize recent advances in manufacturing costs, the Underwear Institute, through its *Institute News* last month stated that "a sounder and more profitable price structure seems imperative." The article quoted leading textile economists as supporting this contention.

•

Style is Keynote of 1938 Swimsuits—September showings of the 1938 bathing-suits and trunks indicated that style will be the weapon of the knitters in competing with the dress-maker type of woven fabric swimsuit. The new knits are brilliantly designed, fancy stitches and novelty color combinations being the highlights. The pattern range in men's trunks is especially varied and colorful, according to the samples.

•

Something New in Modelling!—On the theory that professional models tend too much to "glorify" garments resulting in disullusionment later by the less statuesque customer, Colonial Knitted Sportswear, Chicago, has developed a new type of "everyday woman" promotion. The garments are photographed on factory employees of the firm and then the photographs are used as displays in stores. The retailers have praised the displays as effective because they are realistic.

•

British Women Prefer U. S. Hosiery—Increasing demand for American full-fashioned hosiery in the United Kingdom is reported to the Department of Commerce from American Trade Commissioner E. B. Lawson, London, who adds that this business is again becoming "a small but valuable volume" to American mills.

•

Distribute Wool Underwear Data—The Associated Wool Industries has distributed to more than 3,000 retail buyers, two promotional pamphlets describing wool underwear construction as to wool content and price range, and citing the selling attraction of the products of 35 underwear mills.

Knit Goods

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Processing Digest

IN June, 1936, speaking of the research on drying which had just been proposed by the U. S. Institute for Textile Research, we said: "We feel certain that no concern which is engaged in textile processing can afford to pass up this chance to learn at the earliest opportunity those conditions at which drying of the various fibers can be carried out most efficiently and with the minimum amount of damage to the fiber." Since then arrangements have been completed for carrying out the research at the Bureau of Standards, and 46 companies have become financial sponsors of the project. These concerns are entitled to receive confidential reports—of which the first has already been mailed—as the study progresses. But there is no limit to the number of cooperators; additional funds will expedite the investigation. Now the research is assured, we are confident that many more companies will grasp this opportunity to obtain inside information on the important operation of textile drying.—*Editor.*

Print Price Scale—Late last month rayon and silk printers established a new scale of prices which became effective immediately and which showed increases ranging from about 1 to 3c. per yd. for most constructions. This action follows the formation in August of the Rayon & Silk Printing Association, which includes both large and small companies, to put into effect certain of the measures recommended by General Johnson for improvement of conditions in the industry. Sharpest increases are noted in the case of acetate fabrics. The last previous attempt to increase printing prices was in December, 1936, when quotations were advanced over opening prices. It was found impossible, however, to maintain the scale set at that time, and subsequently prices reverted to their earlier levels. With all the printers now organized in one association, the trade has more assurance that the present quotations can be maintained.

•

Developments in Finishing will be be considered at the regional meeting of the Textile Division, A.S.M.E., to be held, Oct. 15, at Massachusetts Institute of Technology, Cambridge, Mass. The technical session, which will be held in the North Hall of Walker Memorial starting at 2 p.m., should prove of equal interest to chemical and mechanical engineers. The program includes the presentation of the following papers: "Recent Developments in Wet Finishing and Dyeing Machinery," by Paul Merriam, Riggs & Lombard, Inc., Lowell, Mass.; "Recent Developments in Textile Drying," by B. R. Andrews, Andrews & Goodrich, Inc., Boston; and "Some Comments on the Growth of the Cotton Spindleage of this Country and Its Future," by A. W. Benoit, Charles T. Main, Inc., Boston. On Friday morning members and guests of the division will make an inspection trip of the Watertown plant of Hood Rubber Co., starting at 10 a.m. Lunch will be served at 12:30 p.m. in the North Hall of the Walker Memorial.

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Consumer-Wear Testing was discussed by Harry Levine, president of Texile Testing and Research Laboratories and also president of the American Association of Textile Technologists, before the Piece Goods Buyers Association, New York, Sept. 28. "As I see it," said Mr. Levine, "the movement for fiber identification had its birth in complaints at the time improperly identified synthetics or combinations came into the field. Grief accompanied the application of previous dry-cleaning and laundering methods to these materials. . . . To be thorough, we should also tell the buyer by labels that the strength, slippage, shrinkage or stretch, and color fastness to various hazards are excellent, good, fair, or poor. No one can deny that the consumer would understand these simple terms. . . . The returns evil could be reduced materially. Labels would aid in a movement toward quality in merchandise which would help to increase gross sales and profits, and maybe even the fabric manufacturer would eventually see a profit. . . . It has been an eternal wonder to me as to why most everyone has figured the cost of testing and how very few have figured the cost of not testing."

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Preshrunk Woolens and Worsteds—Increasing demand on the part of consumers for use of preshrunk fabrics in women's and children's ready-to-wear garments is resulting in the insistence on the part of many department stores of a guarantee from their manufacturers that such fabrics will not shrink when dry cleaned, pressed, or worn in inclement weather. According to the Women's National Exposition of Arts and Industries, out of 78 stores in 22 states which replied to a questionnaire, 61 replied that they would insist upon such a guarantee.

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Trade Waste Treatment—A new method of treating trade waste from a rayon knitting mill, in which waste ashes were used in place of more expensive chemicals, was described by Foster D. Snell, at a meeting of the American Chemical Society, held Sept. 7, in Rochester, N. Y. In order to dispose of the waste liquor from the boil-off operation, which ranges from 15,000 to 60,000 gal. per day, a plant in Sparta, Ill., makes use of a filter bed 3 ft. deep and containing 1,440 cu.ft. of ashes. About one-third of the total amount of ashes is replaced each week; therefore each charge of 30 tons of ashes treats about 1,000,000 gal. of boil-off liquor which contains in the neighborhood of 6,500 lb. of oils and 1,500 lb. of soap, soda ash, etc. This method of treatment has been in use for about a year and has given satisfactory results. The effluent from the ashes contains considerable suspended matter at times, but is much clarified from the original condition.

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Chemical Show—Plans are rapidly being completed for the Sixteenth Exposition of Chemical Industries, to be held at Grand Central Palace, New York, Dec. 6 to 11. Aside from the many exhibits, another important feature of the exposition is the student course in chemical engineering, which will be directed by Professor W. T. Reed, Dean of Chemistry at Rutgers University.

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Cotton Finishing Activity continues at a lower-than-normal rate, and on some constructions prices have been forced down to profitless levels.

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Opens Laboratory—Neva-Wet Corporation of America held a formal opening of its new fabric exhibition auditorium and testing laboratory at 500 Fifth Ave., New York, on Sept. 22. The laboratory, which was installed by the United States Testing Company is designed to furnish impartial information to consumers and retailers. S. Howard Lefkowitz, president of Neva-Wet Corp., announced that all fabrics subjected to the water-repellent process of his organization hereafter will bear a tag showing the percentage of each fiber involved.

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A.A.T.C.C. Notes—The fall meeting of the Southeastern Section of the American Association of Textile Chemists & Colorists was held at LaGrange, Ga., on Oct. 9. R. B. Adams, of Callaway Mills, spoke on "Physical Testing of Textiles"; and P. H. Collier, also of Callaway Mills, spoke on "European Textile Laboratories." A. R. Macormac, Alabama Polytechnic Institute, presented a formal discussion of the paper on physical testing.

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Mill News

Cotton Mill News

Algodon Mfg. Co., Bessemer City, Ala.—Equipment in cotton mill No. 2 of this company, comprising about 7500 spindles and 290 looms, has been sold to the Walker Machine Co., Gastonia, N. C., and plant will be dismantled.

Lanett (Ala.) Mill of West Point Mfg. Co. has let general contract to Batson-Cook Co., West Point, Ga., for one-story addition, 100 x 100 ft., including improvements in present mill. Cost over $50,000, including equipment. Robert & Co., Atlanta, Ga., are architects and engineers.

Opelika (Ala.) Mills have installed vacuum lint and dust collectors on battery of automatic spoolers; equipment furnished by Textile Shop, Spartanburg, S. C.

Pepperell Mfg. Co. Opelika, Ala. has recently added 52 Cooper Hewitt lamps to the lighting equipment in its broad sheeting weave room.

Raybestos-Manhattan, Inc., Bridgeport, Conn., has let general contract to Otto F. Burghart, 333 North Ave., for one-story addition to mill at Stratford, Conn., 22 x 121 ft. Cost close to $40,000.

Manchester (Conn.) Net Co., manufacturers of net laundry bags, has been sold to William Walsh. Its equipment includes 11 looms.

Elizabeth Bartlett Mill, Acworth, Ga., closed for six months, has been sold to new interests, and the name changed to the **Cherokee Mill**. F. C. Mills is president; E. W. Nichols and A. L. Mason, vice-presidents. The mill will be started up.

Exposition Cotton Mills, Atlanta, Ga., have awarded general contract to C. M. Guest & Son, Anderson, S. C., for improvements and repairs in mill building to cost over $20,000.

Georgia-Kincaid Mills, Griffin, Ga., is now installing 126 new Cooper-Hewitt lamps in weave room of Mill No. 2. J. E. Sirrine & Co. are the engineers.

Royston (Ga.) Spinning Mill recently completed the installation of $50,000 worth of additional equipment.

Plymouth Braid Co., 358 South Ave., Whitman, Mass., has been chartered with capital of $10,000, to operate a cotton braid mill. Charles M. Porter is president, and John W. Gray, treasurer.

Worcester (Mass.) Woven Label Co., 97 Webster St., recently organized, plans operation of a local mill. Charles Grace is president, and Julius L. Aisenberg, treasurer.

Adams Co., New York, with two plants in Connecticut, has been ordered by Federal Court to submit to liquidation.

Cliffside (N. C.) Mills, Haynes unit, has had its slasher unit equipped with the "No Drip" Slasher Hoods, designed and installed by the Textile Shop at Spartanburg, S. C.

Randolph Mills, Franklinville, N. C., is erecting an addition to inspection department of Unit No. 2.

Icard (N. C.) Cordage Mfg. Co. has begun modernization including a new boiler and a smoke stack; also a water tank for 100,000 gal.

Marshall (N. C.) Mill & Power Co., formerly the old Capitola Mfg. Co., is now in operation, after $70,000 has been expended getting the plant in condition.

Hermitage Mfg. Co., Nashville, N. C., successor to **Washington Mfg. Co.** has begun operations.

Rosemary Mfg. Co., Roanoke Rapiids, N. C., is completing plans and will take bids soon on general contract for new three-story addition. Cost over $60,000. J. E. Sirrine & Co., Greenville, S. C., are engineers.

Amazon Cotton Mills, Thomasville, N. C.—Gaston County Dyeing Machine Co. recently installed a stainless steel dyeing machine, as well as auxiliary equipment for dye house.

Wade Mfg. Co., Wadesboro, N. C.—An additional installation of beam and package dyeing machine has been made by the Gaston County Dyeing Machine Co.

Springs Cotton Mills, Eureka plant, Chester, S. C., are having the No-Drip slasher hoods installed by the Textile Shop of Spartanburg, S. C. When large addition to No. 1 Mill at Fort Mill is completed an addition to mill No. 2 will be built.

Gaffney (S. C.) Mfg. Co. is completing a modernization program involving 65 new cards, 18 Whitin 8 x 4 speeders, 25,000 spindles. The remaining 1000 of the mills 2,300 looms will be equipped with pick clocks. Parks-Cramer supplies automatic cleaners for the spinning.

Graniteville (S. C.) Mfg. Co. is enlarging its Graniteville unit by adding 28 ft. to the main mill building, in which the machinery will be rearranged.

Langley (S. C.) Cotton Mills is the name of the former Aiken Mills, Inc. They have recently been completely modernized, including installation of 188 special, new-type looms.

Santee Mills, Orangeburg, S. C., have work under way on improvements in mill, including installation of new equipment; work to be completed by close of year. Company has tentative plans for removal of branch mill at Bamberg, S. C., to Orangeburg.

Bobo Weaving Mills, Inc., Spartanburg, S. C.—Plans are under way for a dissolution of this company and liquidation.

Nantex Co., Spartanburg, S. C., has plans for establishment of new branch mill at Blackville, S. C. New unit will be one-story, estimated to cost close to $60,000.

Ware Shoals (S. C.) Mfg. Co. has had two 120-spindle automatic spoolers equipped with J. C. Paddock Co.'s new lint cleaning system.

Oconee Textiles, Inc., Westminster, S. C., has doubled the capacity of its carding division, with the installation of 48 new cards, making a total of 96 machines in the department. Other improvements are being carried out at the mill. The weaving has been discarded. J. E. Sirrine & Co., Greenville, S. C., are engineers. Company is an interest of the Beacon Mfg. Co., Swannanoa, N. C.

Knoxville (Tenn.) Cotton Mills, Inc., machinery, has been purchased by the Walker Engineering Co., Gastonia, N. C., and has been dismantled.

Bonham (Tex.) Cotton Mills have work under way on a moderization program, including installation of new drawing and long-draft spinning equipment.

Gonzales (Tex.) Cotton Mills have been acquired by new interests headed by S. M. Ainsworth, Ross and Fred Boothe, all of Gonzales, and Miller Ainsworth, Luling, Tex. The plant has been idle for about six years and plans are under way for early resumption.

Lone Star Bag & Bagging Co., Houston, Texas, announces plans for an expansion program, which will cost about $75,000.

Nalven & Son, narrow fabrics, will build an addition to ribbon plant in Cliftondale Park, near Clifton Forge, Va., install 55 additional looms and employ 200 more workers by December.

Wool Mill News

Scheuerman Bros., Inc., Des Moines, Iowa, is in the hands of W. J. Goodwin, Jr., as receiver.

Clinton (Mass.) Mills, manufacturers of worsteds, are installing 24 new 82-in. looms which increase the number of looms in operation from 96 to 120.

Aetna Mills, Inc., which operates the Shirreffs Worsted Co. mills in Fitchburg, Mass., has taken over operation and ownership of the Star Worsted Mills, Fitchburg.

Bedford Mills, Lowell, Mass., was sold to Southwell Wool Combing Co., North Chelmsford, Mass., according to statement by E. G. Norman, reporting, as master, to the Superior Court.

Thayer Woolen Co., North Oxford, Mass., idle for two years, has been newly organized by the North Oxford Garnetting Co., which will manufacture rayon waste. New company is incorporated for $50,000 and George Saad, of Oxford, is president.

Tiffany Woolen Mills, Webster, Mass., are being liquidated as of Aug. 31.

L. W. Packard & Co., Ashland, N. H. is installing a 3-cylinder set of Davis & Furber cards

Gordon Woolen Mill, Hillsborough, N. H., is undergoing extensive remodelling and building a new power plant.

Wyandotte Mill, Rochester, N. H., has contracted for construction of a cement dam to replace a wooden structure.

Homestead Woolen Mills, West Swanzey, N. H., has installed four new Davis & Furber spinning frames involving large package principle.

Middlebrook Mills, Inc., Bound Brook, N. J., formerly the Boundbrook Woolen Mills, has been closed and is being offered for sale.

S. Stroock & Co., Newburgh, N. Y., reports net profit of $196,560 for eight months ended Aug. 31, 1937, compared with $161,225 for similar period in 1936.

Chatham Mfg. Co., Elkin, N. C.—Installation of combination package, beam and cone dyeing machine and vacuum extracting unit was made by Gaston County Dyeing Machine Co. A complete line of auxiliary equipment for beam and cone dyeing was also furnished.

Holmesburg, Pa.—The Toronto (Ont.) Carpet Co., has sold its local mill at Holmesburg, formerly the plant of Barrymore Seamless Wiltons, comprising 8 1/4 acres of land and buildings, to the Light Corrugated Box Co., for a reported consideration approximating $200,000.

Branch River Wool Combing Co., Inc., No. Smithfield, R. I., has contracted with Temple & Crane, Inc., Boston, Mass., to add another storehouse unit of reinforced concrete, two stories high, 250 x 95 ft., and drainage system improvements. Lockwood Greene Engineers, Inc., Boston, have been retained.

French Worsted Co., Woonsocket, R. I., has awarded contract for a brick plant addition, 80x92 ft., to the Pelletier Construction Co., 189 Sayles St., Woonsocket.

Jewell Brook Woolen Co., Ludlow, Vt., has begun modernization and improvements in mill, including installation of new spinning and carding machinery, purchased from the Davis & Furber Machine Co., North Andover, Mass.

Appleton (Wis.) Woolen Mills have plans for a top-story addition to present two-story mill unit, to be used primarily for expansion in storage division. Orbison & Orbison, Appleton, are engineers.

Prairie du Chien (Wis.) Woolen Mill Co. has plans for new addition to mill, to be equipped as a dye house. Company will also make improvements in boiler plant.

Harding Carpets, Ltd., Brantford, Ont., has work nearing completion on one-story addition, to be equipped as a spinning division for woolen carpet yarns; cost close to $60,000.

Rayon & Silk Mill News

Cheney Bros., Manchester, Conn., disposed of 474 houses, an inn, a business block and a group of garages by auction late in September, thus disposing of nearly all its non-industrial holdings.

Windham Silk Mfg Co., Waterbury, Conn., has closed and will vote to liquidate.

Union, Miss., Town Council has engaged Krouse & Brasfield, Meridian, Miss., architects, to prepare plans for one-story mill (previously reported), about 20,000 sq. ft. floor space, to be occupied as a silk throwing mill, under long-term lease, by a company whose name is temporarily withheld.

Maryland Silk Mills, Inc. will liquidate its plant at West Warren, Mass., and close down according to an announcement by Jehiel Weintraub, president.

Tubize-Chatillon Corp., New York, reports net earnings for first six months of $678,722. Authorization of a $5,000,000 bond issue is sought.

Celanese Corp., New York, N. Y., through its subsidiary, American Cellulose & Chemical Co., New York, is laying out site for proposed new mill on tract of about 1200 acres of land in Giles County, Va., estimated to cost about $5,000,000, with machinery for the first unit. Plans will be prepared by F. T. Small, company engineer at mill at Amcelle, near Cumberland, Md.

Oswego (N. Y.) Silk Co., a subsidiary of **Capital Silk Co.**, has taken over part of the old Oswego Yarn Mills and 80 looms will be set up.

Phoenix Silk Mfg. Co., New York, N. Y. Plans are under way for a reorganization of this company. Evan W. Walters is trustee in bankruptcy.

Champlain Spinners Inc., Whitehall, N. Y., has completed construction of dykes surrounding mill property to guard against floods.

Central Falls (N. C.) Mfg. Co. is about to construct an addition to house additional equipment, including looms.

Industrial Rayon Corp., Cleveland, Ohio, reports net profit for first six months of $181,371 comparing with

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Mill News

$457,076 for similar period in 1936. The firm's new plant at Painesville, Ohio, will use 400,000 glass bricks, the order having been placed with Owens-Illinois Glass Co.

Plaza Silk Co., Beavertown Pa., is setting up new looms as they arrive. It takes the product of the Middleburg Throwing Co. William Forest of New Bedford, Mass., is superintendent.

Waypoyset Mfg. Co., Pawtucket, R. I.—Machinery and equipment of this company is being sold at private sale in small lots by Benjamin C. Chace, receiver, in connection with the liquidation of the business.

Tennessee Valley Textile Mills, Rockwood, Tenn., will reopen and operate the former **Roane Textile Mills** operating 40 looms on broad silks. Norman Simpson, the new owner, is superintendent.

E. I. du Pont de Nemours & Co., Rayon Division, Ampthill, Va., will have its local rayon production increased by 25% when the new unit is ready for operation next spring. It is said that part of it will be ready to operate in January. A $75,000 recreational building is being put up at Waynesboro.

Nalven & Son, Inc., Cliftondale Park, near Clifton Forge, Va., plan new one-story addition to silk mill, with equipment installation to include about 55 additional looms and accessories, making a total of 100 looms at the mill.

Grottoes (Va.) Silk Mill has gotten back into operation after being closed down for about 18 months.

Pulaski, Va.—Negotiations have been completed by city officials, headed by E. W. Calfee, mayor, with a silk throwing company at New York, N. Y., name temporarily withheld, to establish and operate a local mill.

Knitting Mill News

Lengel-Fencil Co., Anniston, Ala., is moving its equipment, consisting of 28 knitting machines and auxiliary equipment, to the unit of the company at Corinth, Miss. Both units are operated by the Meinig interests of Reading, Pa.

Rodgers Hosiery Mills, Athens, Ga., will install 11 new machines at a cost of $11,000 each, and call for 50 additional operatives.

Abbeville, La.—City officials have awarded general contract to Lee Carroll, Eufaula, Ala., for one-story building on Washington St., to be occupied as a knitting mill by a company whose name is temporarily withheld. It is estimated to cost over $40,000.

Bethlehem Knitting Mills, Inc., Chicopee, Mass., will liquidate. Walter S. Stevens, Northampton, is referee in bankruptcy.

Columbia (Miss.) Knitting Mills is erecting an addition which will about double the present 2,000 doz. pr. half hose capacity.

Durant (Miss.) Mfg. Co., organized as municipally operated silk hose plant under ten-year tax exemption, began operations in its new $25,000 building on Sept. 20. Plant covers 15,000 sq. ft. with 50 machines, working five-day, eight-hour shift. Output is to be 5,760 pairs hose weekly with 175 employed.

Clayton Knitting Mills, Inc., Brooklyn, N. Y., have been organized with capital of 200 shares of stock, to operate a local mill. New company is represented by B. Robbins, 25 Warren St., New York, attorney.

Roff Knitting Co., Cohoes, N. Y., has purchased Harmony Mill No. 5 at an auction sale for $4,500.

Campe Corp., New York, reports net profit of $66,138 for the year ended July 31, 1937, against $91,214 in the previous fiscal year.

Trojan Maid, Inc., Troy, N. Y., plans expansion following ratification of a new working agreement between officials and employees.

Wiscassett Mills Co., Albemarle, N. C., has begun an expansion and modernization program to include installation of 40 new Kalio-Lieberknecht 42-gauge full-fashioned knitting machines, to replace a like number of old-type units, which have been sold, 26 new high-speed leggers and 14 high-speed footers, with three-carrier and jacquard attachments, including complete auxiliary equipment. Entire project will cost close to $400,000. Company is a unit of the Cannon Mills, Inc.

Knit Products Corp., Belmont, N. C., has taken bids on general contract for new two-story addition, and plans equipment to double present capacity. Work will begin soon. W. S. Lee Engineering Co., Charlotte, N. C., is engineer.

Century Hosiery Mills, Burlington, N. C., has been chartered, and will make, buy and sell hosiery and knit goods. The concern is capitalized at $80,000, with $1,200 subscribed by Jones Fuller, R. P. Reade and F. L. Fuller, Jr., of Durham, N. C.

Nordham Hosiery Mill, Charlotte, N. C., has completed the installation of new machinery which cost about $20,000.

Concord (N. C.) Knitting Co. has completed a modernization program, which included the installation of a water softener, hot water storage tank, new dye house, Fletcher extractor, and the rearrangement of machines.

Thornton Knitting Co., Denton, N. C., plans one-story mill addition, 64 x 100 ft., to be operated in conjunction with the Maurice Mills Co., Thomasville, N. C., T. E. Jennings, treasurer, being likewise identified with the Thornton company. New unit will give employment to about 150 operatives and is estimated to cost close to $50,000.

Charles H. Henderson, Hickory, N. C., has been granted a building permit to erect a hosiery finishing plant, at an estimated cost of $1,500.

Pacolet Knitting Co., Lynn, N. C., has constructed a new brick building of modern type to replace the dyeing department, which was destroyed by fire recently.

Erdeste Hosiery Mills, Curwensville, Pa., has been organized by four men connected with Reading (Pa.) Maid Hosiery Mills, to operate the mill formerly the Erdman Hosiery Mills. H. R. A. Schumann is president.

Zimmerman Mills have been established in Philadelphia, Pa., at Castor and Erie Aves., to manufacture knit goods, under the management of William Zimmerman, Wyncote, Pa., and Ralph B. Thomas, Philadelphia.

Belle Knitting Corp., Sayre, Pa., has filed a petition seeking authority to reorganize. Liabilities are listed at $882,415 and assets, $1,675,195. Executive headquarters are at 261 Fifth Ave., New York City.

Mill News

Gault Hosiery Mfg. Co., Union, S. C., has sold its machinery and equipment to Morris Speizman, machinery dealer, Charlotte, N. C. Some of this machinery is being scrapped with part of it being offered for resale.

Miller-Smith Hosiery Mills, Etowah, Tenn., recently completed the installation of approximately 100 new single unit, full-fashioned machines.

Standard Knitting Mills, Inc., Knoxville, Tenn., have work under way on remodeling a section of mill. Contract has been let to the Palmer-Bee Co., Westminster St., Detroit, Mich., for installation of a new conveyor in Mill No. 3, to carry finished goods from mill to storage warehouse.

Soddy (Tenn.) Hosiery Mills are considering construction of a new mill on local site to replace present plant.

Aycock Hosiery Mills, South Pittsburg, Tenn.—Plans are maturing for new company to take over and operate mill, now held by the Reconstruction Finance Corp., through foreclosure.

New England Hosiery Mills, Providence, R. I., are in receivership.

Vanette Hosiery Mills, Dallas, Tex., have approved plans for one-story addition, to provide for new knitting machines and auxiliary equipment, to increase capacity about 25%. Cost over $40,000, including equipment.

Marshall Field & Co., Fieldale, Va., have constructed an addition to their full-fashioned mill, providing 30,000 sq. ft.

Lynchburg (Va.) Hosiery Mills have completed construction of new one-story addition on Fort Ave., 50 x 100 ft., and will place in operation at once. New unit will provide for expansion in full-fashioned unit and dyeing division.

Sale Knitting Co., Martinsville, Va., capitalized at $250,000, will manufacture underwear.

Herbert Hosiery Mills of Canada, Ltd., are moving their plant from 2 River St., Toronto, to 425 Coxwell Ave., Toronto, Ont., about the middle of October.

William Collie, owner of woolen mills, Way's Mills, Que., has purchased the Caldwell Woolen Mills plant, Appleton, Ont. The firm makes socks and woolen knit goods.

Sheer Silks, Ltd., a new concern managed by J. W. Jerry, for a number of years plant superintendent of Canadian Silk Products, Ltd., has leased space in an idle brewery on Water Street, Sherbrooke, Que. The new firm will manufacture hosiery.

Processing Plant News

Housatonic Dyeing & Printing Co., Derby, Conn., has incorporated to dye and print various kinds of textiles. Capital stock is $100,000. Paul Webb, Hamden; and Ralph H. Clark, Derby, are the principal incorporators.

Arnold Print Works, North Adams, Mass., have had their 77B proceedings terminated by court order based on plan approved April 12.

Chromite Textile Printing Co., Inc., 526 West 26th St., New York, N. Y., has leased a floor and penthouse in building at 252–56 West 64th St., totalling about 30,000 sq. ft. of floor space. Present works will be removed to new location and capacity increased.

Whitestone Dye Works, Inc., Maspeth, L. I., N. Y., has had its 77B reorganization plan approved by the court. Alterations in building are under way to permit installation of additional machinery.

Cretona Dye & Print Works, Clifton, N. J., in bankruptcy, is being assisted in working out a plan whereby wages due employees may be paid 100%.

Passaic (N. J.) Piece Dye Works have closed down indefinitely rather than deal with the TWOC.

Associated Dyeing & Finishing Co., Paterson, N. J.—Order to show cause why a receiver should not be appointed was given by court in late September.

National Dyeing & Printing Co., Paterson, N. J., has reopened its roller printing department after improvement in its facilities.

Quality Silk Dyeing & Finishing Co., Paterson, N. J., has been formed to operate on pure dye silks by A. A. Porter and Joseph Schmid, formerly with Victory Dyeing & Finishing Co.

Printex Corp., Paterson, N. J., has been organized to take over and consolidate the Primrose Textile Printing Corp., 17 Waverly Pl., New York, N. Y.; Jeandros Dye & Print Works, New Bedford, Mass.; and the U. S. Novelty Printing Co., 150 East 7th St., Paterson. New company has taken over property on East 26th St., near the Boulevard, and on East 7th St., near Wood St., both Paterson, and will remodel and equip for two plants, operating as Mills Nos. 1 and 2, respectively. The new company also has absorbed the Trojan Piece Dye Works and Federal Textile Printing Co., both at 3 East 26th St., Paterson, one of the mill properties referred to above, Mill No. 1, and will use equipment of these two latter companies, in addition to additional machinery to be installed. Establishment of the two plants noted will cost about $175,000, with facilities for employment of about 600 operatives. The United States Novelty Printing Co., will maintain its separate identity at present address, which is the property comprising Mill No. 2 of the consolidated organization. Arthur Nazzaro is president; Morris Blackman, treasurer, formerly connected with Textile Dyeing & Printing Co., Fair Lawn, N. J.; and Louis Colianni, secretary, heretofore associated with the Federal company, noted.

Cloverdale Dye Works, High Point, N. C.—Installation of a two-kier package dyeing machine and sample machine is being made by Gaston County Dyeing Machine Co. They have also purchased several package carriers and other auxiliary equipment.

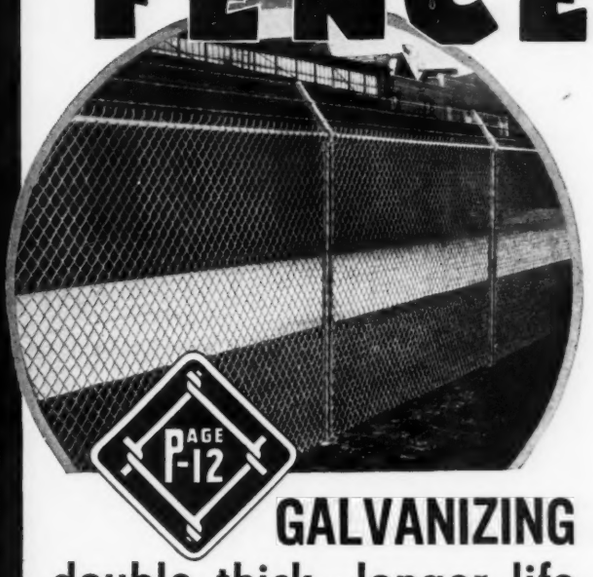
Hanes Dye & Finishing Co., Winston-Salem, N. C., has increased the capacity of its plant considerably through the installation of adtional modern bleaching and finishing equipment, which is already in operation.

Hellwig Silk Dyeing Co., Ninth St., Philadelphia, Pa., has taken out a permit for new one-story addition to mill at Comly and Milnor Sts. Cost close to $25,000, with equipment.

Apponaug (R. I.) Co. reports net loss of $50,946 for the fiscal year ended June 30 compared with net profit of $9,053 for preceding fiscal year.

Central Franklin Process Co., Chattanooga, Tenn., has awarded general contract to Mark K. Wilson Co., for two-story addition, 69 x 115 ft., to be used as warehouse; cost about $35,000.

PAGE FENCE



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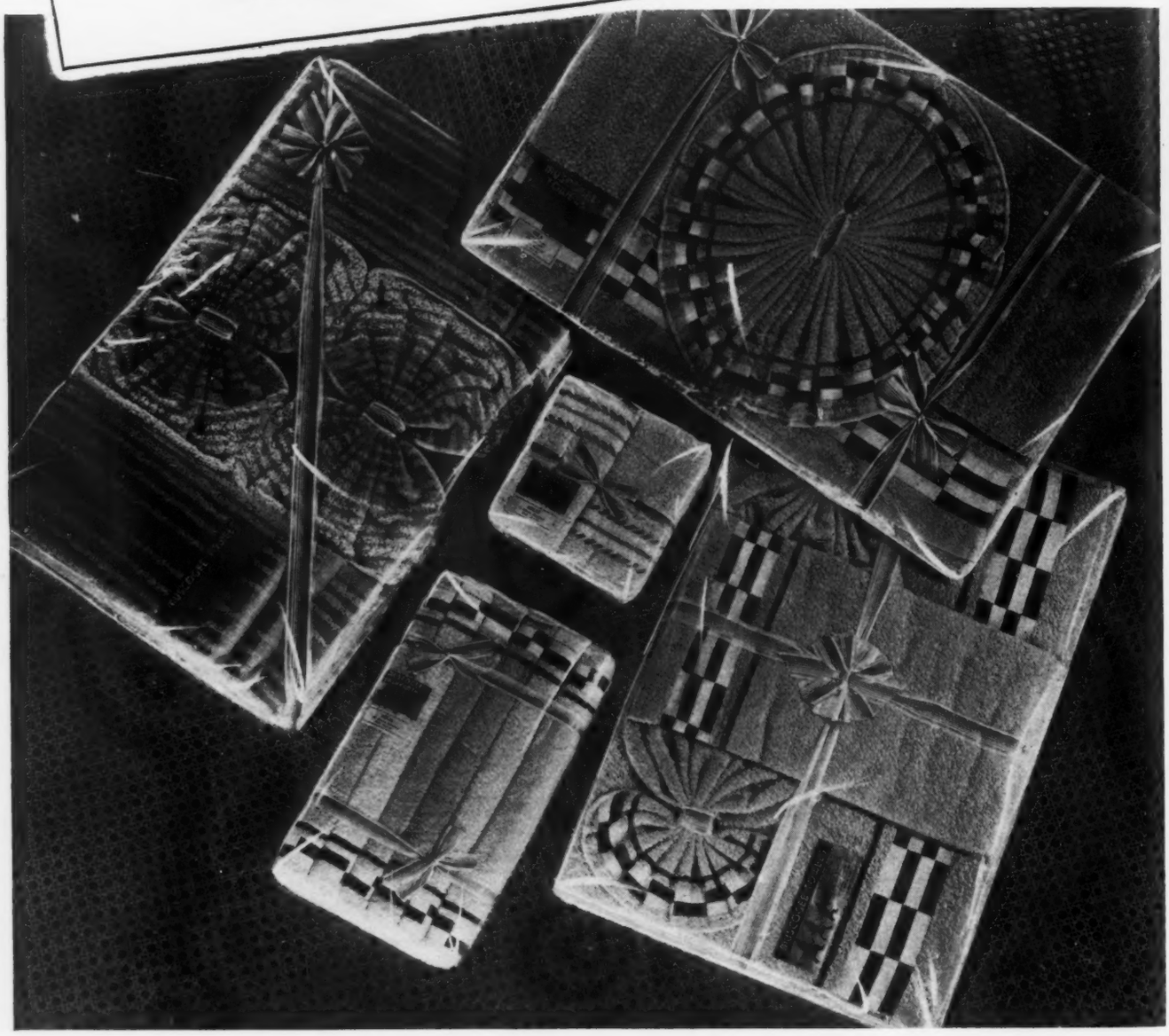

MR. GEORGE P. SWIFT, Vice President of Muscogee Manufacturing Co., Columbus, Georgia, says:

"Our customers will sell more sets of towels, wash cloths, bath mats, etc., in Cellophane transparent wrapping this Christmas than ever before in the history of this company.

We are sticking with Cellophane on our 17 sets as the most effective merchandising medium, since it "shows" the goods; and, we know from experience, sells them faster."

IDEAS ON PACKAGING . . . are yours for the asking. Just ask one of our Field Representatives to call. No obligation. Write: E. I. du Pont de Nemours & Co., Inc., "Cellophane" Division, Wilmington, Delaware.

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1. Carding. Davis & Furber Machine Co. Booklet, "Novelty Effects on Wool Cards," tells how mills can develop own fancy yarns; sections give suggestions on card settings, making nubs, flake attachment, core yarn attachment, etc.

2. Packing Braiders. Fidelity Machine Co. Illustrated catalog describes company's range of round and square packing braiders and carriers with detailed data on dimensions and on auxiliary equipment, such as tension weights and change gears.

3. Switches, Valves, Drives. General Electric Co. Folders describe characteristics, uses and advantages of track-type limit switch. Thrustor operated valves, type TSA-10 time switches and winder drives.

4. Clutches. Link-Belt Co. Illustrated list-price catalog gives sizes, dimensions, weights, horsepower ratings, and other pertinent data on friction clutches, with information on selecting clutches for specific services.

5. Industrial Locations. Industrial Commission, City of Paterson, N. J. 72-page volume by Herbert S. Swan, analyzes facilities and advantages of that city as an industrial location, with information on fuel and water costs and waste disposal facilities.

6. Counters. Veeder-Root Inc. Color-illustrated 81-page catalog describes company's complete line of counting devices for the textile industry; volume's three sections cover pick, hank, and lineal-measuring counters; includes special index of counters by types of application.

7. Control Valves. Bristol Co. Bulletin gives constructional and operating information on company's line of synchro diaphragm control valves, with data on sizes, dimensions, and metals.

8. Mill Baskets and Trucks. Continental-Diamond Fibre Co. Color-illustrated booklet discusses basic needs of an efficient material handling system, describing uses, characteristics and advantages of company's line of fibre containers, particularly baskets and trucks for mill use; also covers roving cans, barrels, cases, trays, etc.

9. Cork Cots. Textile Division, Armstrong Cork Products Co. Folder gives comprehensive presentation of company's textile products, including cork cots, worsted roll covers, and loom accessories. Supplementary folder cites advantages of synthetic rubber-like materials for textile roll coverings.

10. Vat Dyeing. R. & H. Chemical Department, E. I. duPont de Nemours & Co. Booklet describes advantages of sodium perborate in vat dyeing to get full color values in dyeing cottons, rayons, silks, woolens, with specific information on operating methods to be applied to the respective fibers; also gives information on causes of uneven dyeing.

11. Organic Chemicals. Carbide & Carbon Chemicals Corp. New edition of "Synthetic Organic Chemicals," 78 pages, comprises industrial reference manual on specifications, properties, and uses of over 80 aliphatic organic chemicals, with authoritative and up-to-date data.

12. Instruments. C. J. Tagliabue Mfg. Co. 56-page volume describes company's line of indicating and recording temperature and pressure instruments, together with complete data on controllers for temperature and pressure, recording thermometers, recording pressure gages, and dial indicating thermometers.

13. Liquid Level Controllers. Cochrane Corp. Bulletin describes liquid level controllers for services in the power and process fields, such as controlling levels and regulating flow of liquids; describes models and combination arrangements suitable for various needs.

14. Diesel Engines. Fairbanks, Morse & Co. Bulletin gives data on construction and application of model 36-A Diesel generating sets, showing representative installations.

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15. Power Transmission. Lewellen Mfg. Co. Catalog presents latest developments in variable-speed transmissions and speed-controlling devices as reflected in company's products; covers shaft bearings; shifting devices; indicators; remote, electrical, and mechanical control; etc.; also information on installations, dimension tables, motor sizes, speed ranges, etc.

16. Vibration Elimination. Korfund Co., Inc. Bulletin analyzes essentials in vibration elimination and describes functions of company's products, including organic material isolators, cork plates, vibro-dampers, etc.; photographs and text describe typical textile mill and other installations.

17. Pipes and Fittings. Haveg Corp. Bulletin describes construction, characteristics, and advantages of company's "41" pipe and fittings; also valves, fume duct, etc.; with dimensions and diaphragm valve data.

18. Motors. Louis Allis Co. 60-page volume describes construction, features, advantages, and applications of all the principle types of commercial electric motors; with analysis of squirrel-cage motors, motors for centrifugals, etc., and engineering data.

19. Refrigeration. Carrier Corp. Semi-technical manual, 48 pages, discusses adaptability of the centrifugal machine for small and large tonnages citing the advantages of its wide range of applications.

20. Mill Scissors. John A. Eberly. Catalog lists company's line of mill scissors, shears, and tweezers, including embroidery scissors, bent and straight trimmers, and pinking shears.

21. Industry Financing. Commercial Investment Trust Inc. Booklet tells how financing helped textile and other firms to modernize equipment and thus improve their business; covers problems presented by adoption of long-draft spinning, long-draft roving, and higher-speed automatic looms.

22. Welded Piping. Linde Air Products Co. Illustrated booklet on welded piping includes sections on pipe and services to be welded, lighter-than-standard-weight pipe, fast economical welding methods, layout, drawings, specifications, etc.

23. Speed Changers. Boston Gear Works, Inc. 98-page pocket size catalog describes a new line of miter gear units and fourteen types of motor-driven speed-changers, together with fourteen types of mechanically operated speed reducers; covers a line of flexible couplings and includes engineering data relative to speed-reducer selection.

24. High Drafting.—Les Brevets Devaux, Pavilly, Seine-Infe, France. Booklet describes new long-draft spinning equipment embodying extra pair of miniature drafting rolls located between front and middle rolls and driven by magnetically-maintained contact with special longitudinal shaft.

25. Packaging. Cellophane Division, E. I. duPont de Nemours & Co., Inc. Illustrated booklet describes textile and other packaging uses for cellophane, with display ideas and lists of authorized suppliers of gift wrapping accessories, made by the company.

26. Bobbin Cleaning. Terrell Machine Co., July issue of *Termaco Times* describes new type K bobbin stripper and Termaco roving bobbin cleaner.

27. Warp Sizing. Charles B. Johnson, July issue *Rayon Warp Sizing Specialist* contains article, "Technology of Warp Slashing," by W. L. Bentley, director Textile Division, Thomas W. Dunn Co.

28. Fulling. National Aniline & Chemical Co., Inc., June issue of *Dyestuffs* contains translation of article "Theory and Practice in Fulling and Felting," by R. Brauckmeyer.

29. Drafting. Saco-Lowell Shops. July issue of Saco-Lowell *Bulletin* contains descriptions of Model M roving drafting system with Uniset weighting; Model 37 lap winder; Model 38 high-speed slashing system; and new vertical conveyor for opening rooms.

30. Wool Finishing. James Hunter Machine Co. September issue of the Hunter *Counselor* contains article entitled "The Art of Making Fabrics of Distinction"; also photographs of modern tenter dryer, stock dryer, and Model D washer.

31. Sodium Silicates. Philadelphia Quartz Co. Illustrated Bulletin No. 178 discusses uses of silicates of soda and sodium metasilicate for use in bleaching, silk weighting, scouring, kier boiling, and other textile applications.

32. Worsted Lubricant. Providence Drysalters Division, Hercules Powder Co. Folder discusses uses of Clarinol, a manufactured oil developed for use as a worsted lubricant.

33. Pyrometers. Brown Instrument Co. Illustrated catalog No. 1102 describes company's line of potentiometer and millivoltmeter types of indicating, recording and controlling pyrometers, together with switches, control relays, valves, and other auxiliary equipment.

34. Color Fastness. Atlas Electric Devices Co. Illustrated booklet describes construction, operation, and applications of Fade-ometer for testing color fastness, with specific reference to its use in dyeing and finishing, rug, carpet, upholstery, and other textile divisions; includes operating instructions and list of representative users in textile and other industries.

35. Roving Cans. Sonoco Products Co. Folder illustrates and describes company's roving cans, with information on construction and low cost advantages.

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